AMERICAN MACHINIST

A JOURNAL FOR MACHINISTS, ENGINEERS, FOUNDERS, BOILER MAKERS, PATTERN MAKERS AND BLACKSMITHS.

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Root's New Sectional Safety Boiler.

Since the introduction of the sectional type of boiler it has steadily gained in popularity, one of the important reasons for this being the fact that in boilers of this construction, whatever their capacity, only small surfaces are exposed to disrupting pressures, so that it is comparatively easy to guard against the effects of disastrous explosions.

The inventor of the boiler illustrated on pages 1, 2 and 3, John B. Root, was one of the first to introduce the inclined water tube, having commenced the construction of sectional boilers with such tubes about twenty years ago, since which time the plan has been extensively employed both in this country and in Europe. The boiler as here shown may be said, then, to represent the experience of twenty years in the construction and use of this type of boiler, the aim having been to correct such defects as time had developed.

As will be seen by the engravings, the complete boiler is made up of a sufficient number of sections to give the power, or capacity required. Each pair of the tubes are expanded into proper headers at each end, and after being placed in position are connected together with suitable caps, as shown. This construction not only permits of the boiler being erected in places inaccessible to the ordinary boiler, but also permits the heating surface, or parts, to be changed at will, *i. e.*, the tubes may be changed end for end, or may be turned bottom side up, thus presenting a new surface to the direct action of the fire and extending the life of the boiler.

The joints between the caps and headers are made of a compressible metal. This is an entirely new departure, so far as we are aware, and does away with the somewhat objectionable features of the gum gaskets as formerly used. These joints being elastic permit of any unequal expansion, that might be caused by inattention or accident, to take place without destroying the headers. After several months' use these joints are, we are informed, as tight as when first made up, notwithstanding the fact that the boiler has been subjected to extremely severe usage while being tested. As an evidence of the severity of these tests, we understand the first boiler constructed on this new principle has frequently been worked up to over double its rated capacity, and then the feed water suddenly changed from a temperature of 186 degrees F. to a temperature of 52 degrees F., and that it has stood these and other similar tests without any evidence of distress, while furnishing steam of 90 lbs. gauge pressure and superheated eight degrees.

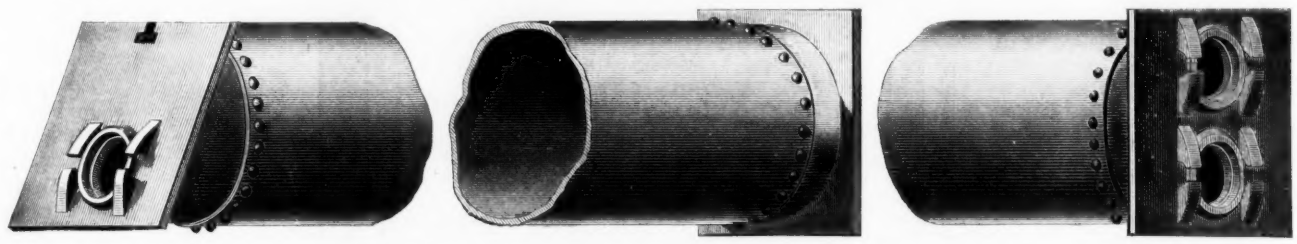
It is held that the tests made have demonstrated that the best economy is obtained by using a portion of the heating surface as superheating surface, thus furnishing steam of a temperature a few degrees above saturation. The feed water entering the drum, shown at the lower rear end of the side view, is made into steam in the tubes, and passing forward and upward is then delivered into the forward end of the superheating drums, which are 14 inches diameter. The flow of steam through these superheating drums being very moderate permits the temperature to be raised from five to eighty degrees above that due to the pressure carried, before it enters the cross drum, to which the safety valve and steam pipe are attached as shown. The degree of superheating within certain limits is controlled by the point at which the water level is carried, and this latter may be anywhere from the center of the drums down to the point at which the lower end of the water column is shown attached.

The covers and connections of the water tubes are so arranged that by loosening nuts and swinging the bolts out of the way, they can be quickly removed, giving free access to the tubes for inspection and cleaning.

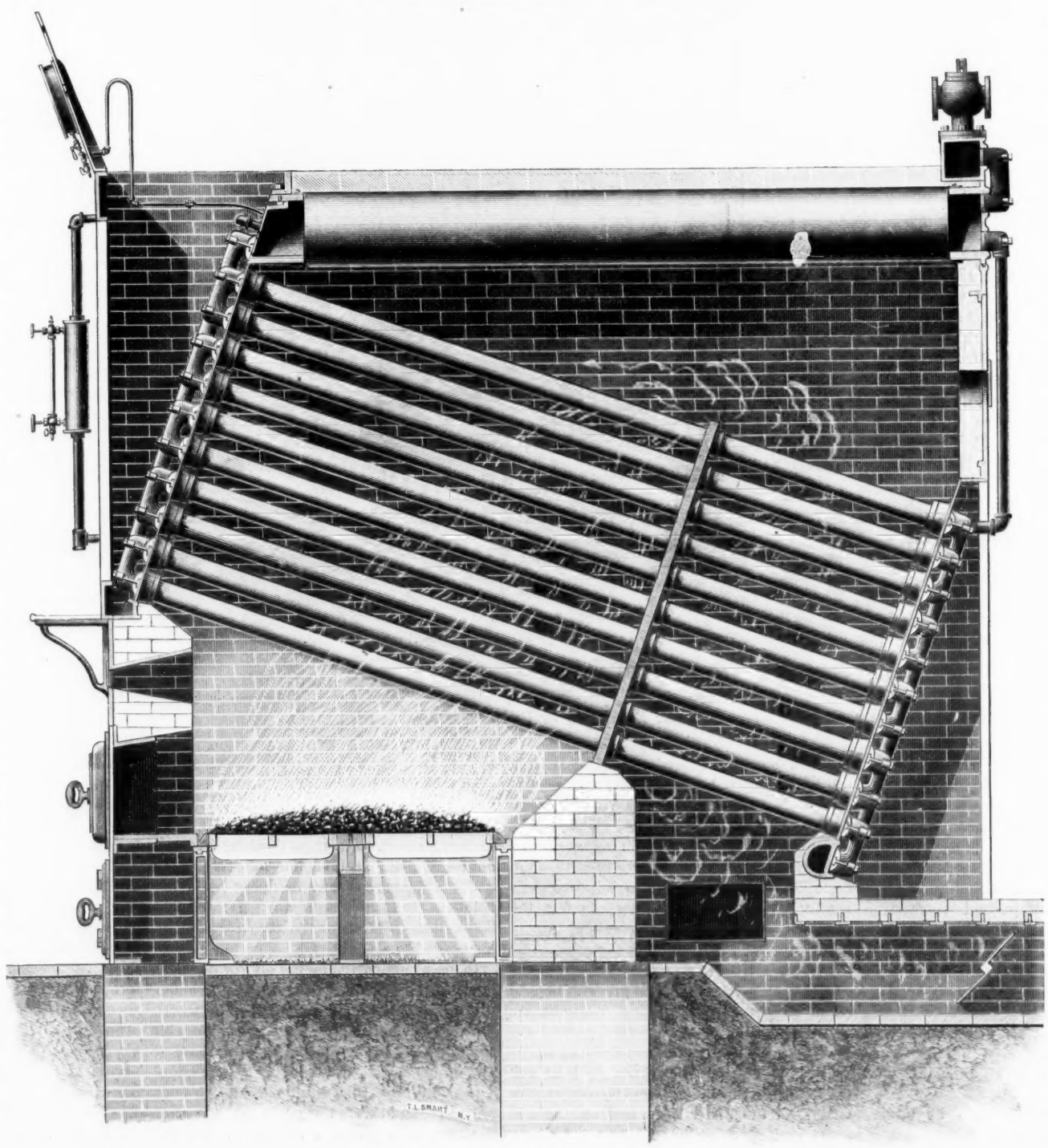
Each system of tubes being connected with a separate steam and superheating tube and possessing all the elements of circulation, is by itself, so to speak, a complete boiler, while the manner of connecting the systems combines the whole so as to equalize both pressure and circulation.

In the construction of this boiler the best material is used, and the most approved modern appliances for insuring accurate work.

The manufacturers are the Abendroth & Root Mf'g Co., 28 Cliff St., New York City.



DETACHED VIEW OF STEAM AND SUPERHEATING TUBE.



SIDE VIEW AND LONGITUDINAL SECTION OF ROOT BOILER.

Boiler Making.

BY GEORGE MARSHALL.

APPRENTICES TO THE TRADE — BRAWN AND BRAINS — LAYING OUT WORK — PUNCHING HOLES — THE USE OF SAL-AMMONIAC.

In a previous article I alluded to the general ignorance prevalent among boiler makers as a class. One of the principal reasons for this is the absence of the apprenticeship system. As a rule, in boiler making there are no apprentices. This is not caused by any trades union objections, but is simply owing to the fact that employers do not desire such help in that line of business; why this is so they cannot themselves explain.

A boy hiring out in a boiler shop presumably does so with the intention of learning the trade. He is generally initiated by placing him with an experienced rivet-heater, who instructs him in that branch of the business, and he is usually kept at rivet-heating until he shows sufficient muscular development to warrant his advancement as a helper.

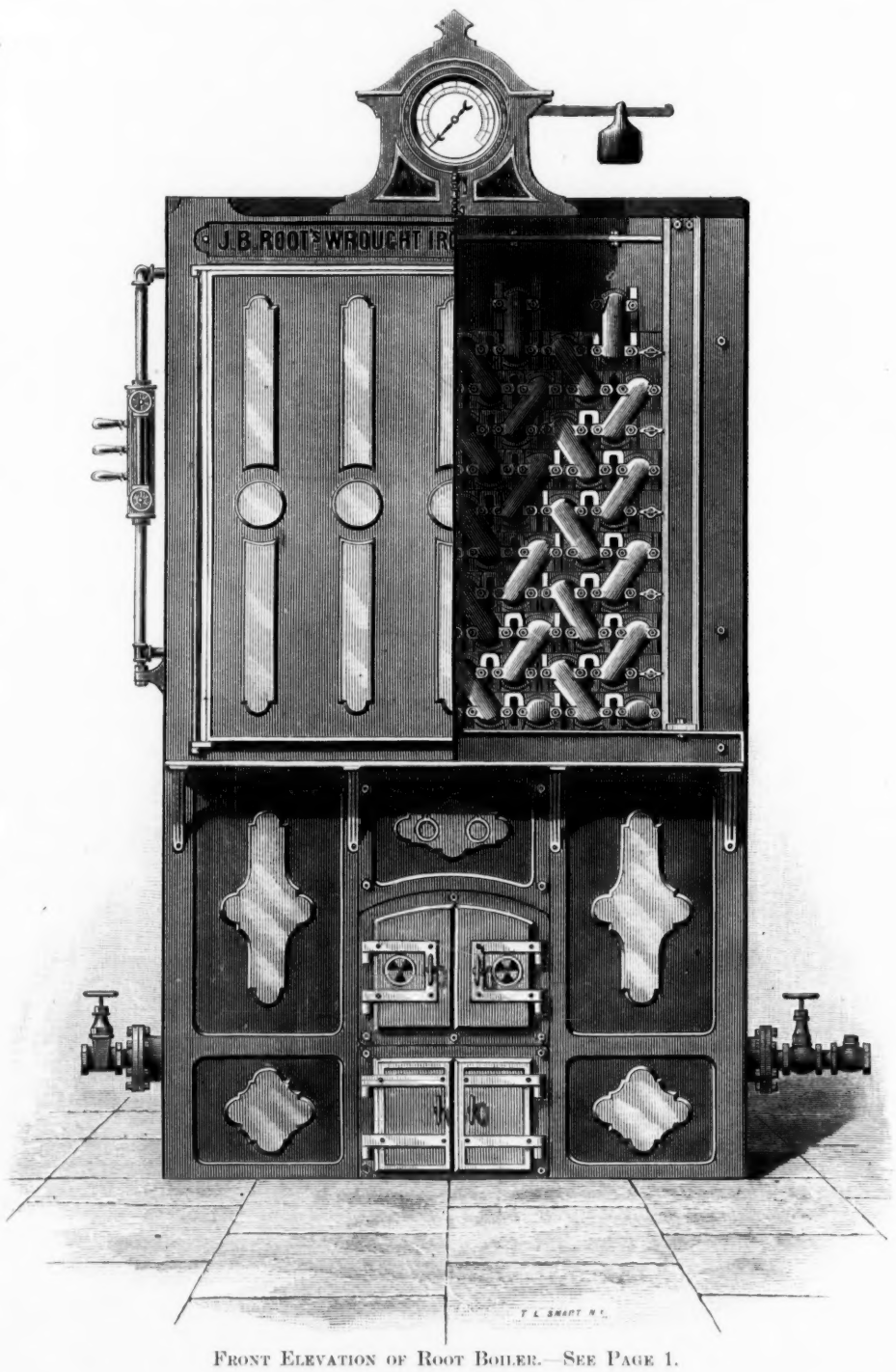
In this position he can, by attention to the methods of the fitter or flanger, learn a great many points in regard to their style of doing work, and, if ambitious, may get an opportunity to do this class of work. But the great ambition of the boy is to be a riveter. Frequently the foreman, in some secluded part of the shop, has his ears assailed by an unusual racket, foreign to the general uproar. Investigation reveals two of the boys busily engaged in re-driving an old rivet, or bolt, which long ago had performed its duty, and was cut out with a piece of an old boiler.

It is a pleasure to watch two skillful riveters drive a rivet. The freedom of action displayed in every movement, the precision with which every blow is given, and the accuracy of eye with which a rivet is formed, until, when completed, it has every appearance of a turned cone, has charms for the observer. This natural grace of action has a peculiar attraction for the ordinary boy's eye, and he feels as if the height of his ambition will only be reached when he has the experience and tact necessary to form as good a rivet as his ideal. Usually his ambition is gratified, and he is given a partner—generally an experienced workman—and his career as a riveter begins, in some cases never to end until old age compels him to take to the calking tool or drill for employment now better suited to his powers.

So with calking; some few boys naturally gravitate in that direction, and, while first-class riveters are almost always to be met with, first-class calkers are scarce. Riveting and calking require no school education. Brawn, not brain, is wanted, and as these branches are the pinnacle of ambition, the talent of this class is not large.

Fitters and flangers do not require much, if any, education; in fact one of the best fitters I ever knew could not tell one letter of the alphabet from the other. Under these circumstances it need not be wondered at that shoemakers, barbers, blacksmiths, and carriage makers have in times of depression, been driven into the boiler shop as helpers, and in time, by aid of the educational knowledge they possessed, have pushed themselves forward into positions of profit and trust. This is really true. I know representatives of each of these industries who either hold positions as foremen, or who are engaged in business for themselves. In fact if the boiler makers were asked when and where they learned their trade, it would be found they picked it up, in ninety-nine out of a hundred cases.

One of the great difficulties in boiler-making is the development, from plans of the complete boiler, and the ability to order iron from a small plan, without having great waste. Another difficulty is the proper location, size and number of braces. This is frequently given by the designer of the boiler or the copyist from another's plans, but in these cases plans are furnished by other parties. The greatest difficulty of the boiler builder is to give the size of boiler for a certain engine, or purpose; to properly figure up its power from heating surface; the grate surface required to perform the work with greatest economy and general detail of appliances to insure success. Cheek and a professed knowledge of all these important considerations sometimes carry a man through, but cheek does not always succeed, and here the display of ignorance becomes prominent. There are many good, intelligent, well educated boiler makers in the country, but as a mechanical class ignorance is more prevalent than in any other trade. Being within the inner circle, I am able to speak of this from my own knowledge and without prejudice or fear of contradiction. Those who have reached a certain skill as workmen, ordinarily rely on that to carry them through life. They make no effort to improve their condition by study or reading; in fact the purchase or perusal of mechanical papers by them is the exception, not the rule.



FRONT ELEVATION OF ROOT BOILER.—SEE PAGE 1.

For this reason so much of the really scientific part of boiler making is given to men of talent in general engineering, but who are entirely ignorant of the practical part of the business. So long as this condition of affairs prevails among boiler makers, so long will the better part of the business be sought after outside of the boiler shop, and so long will plans and specifications be drawn by men whose knowledge on practical work is extremely limited. The scientific men employed to-day advancing the condition of steam boilers and boiler makers, are men who never worked a day in a boiler shop, and they are deserving of the thanks of the steam-using community for devoting so much of their time to the advancement of this subject, as well as the thanks of the boiler makers for efforts to improve their condition. Skilled labor is not as generally required now as it was thirty or forty years ago. The experienced skillful calker has in a measure been superseded by the planer or beveling machine, and the skill required to bevel a sheet on a straight line without injury to the underlying sheet has almost passed away. The riveting machine has also superseded the hand-driven rivet, that is, for general work; but many old fogies, myself included, prefer the hand riveting to that of any machine. Tubing was, in my younger days, a separate and important branch of the business. To-day, "the roller" is put into the hands of the merest novice, and tight work expected. I have known foremen to instruct their men to roll until the plate around the tube began to scale—a dangerous way of doing it, in my opinion. It insures tight work if the metal between the tubes is not broken through by the operation.

In many shops the laying out, or development, of the plates necessary to make a boiler is done by the use of a flat strip of wood, with equidistant holes of proper diameter from one end to the other. One of these is laid on the sheet, held there by weights, and a piece of brass tube is dipped into white or red paint, and this is the guide for the eye of the man who punches the holes. As the punch usually rises an inch above the plate, it will be seen that unusual judgment, or great experience, is required to get the holes in due line, one with the other. In many shops the table punch is used, and the racks being adjusted, plates can be punched with great accuracy, if the calculations are correct. In other shops, where the table punch cannot be introduced, owing to lack of room or means, the plate is divided off equally and centered. This, in connection with a center on the punch, insures the accuracy of the work done.

The spacing and diameter of rivets in proportion to the thickness of plate do not receive due consideration from practical men, and the changes made in this respect in the past twenty years are due more to theoretical than to practical knowledge: yet the change is undoubtedly for the best, as any intelligent boiler maker will admit. Even now many boiler makers leave an undue space between the rivets, and claim a dependence on accuracy of fitting to insure good work. Sometimes a solution of sal.ammoniac is depended upon to make tight joints more than the calking tool or the spacing of rivets. I need hardly say that this is done only by a class of men whose ideas of boiler building consist in the desire to acquire the greatest amount of money in the least possible time, regardless of results.

This use of corrosive elements in a shop is becoming so well understood that many persons insert a clause in their specifications forbidding their use. That many more may benefit by this information, the columns of the AMERICAN MACHINIST are used to publish the fact, in the hope that the aid of chemicals to insure tight work may be abolished.

Who Invented the Engine Truck?

In a recent lecture on engineering triumphs, an eminent English engineer gives American locomotive builders credit for having adopted the four-wheel truck, or bogie, as they call it, but insists that it was an English invention. This is a claim which has been repeated so often without contradiction that Englishmen now believe that their countrymen were the inventors of what is a distinctive feature of American locomotives. There is no more foundation for Englishmen claiming the invention of the engine truck than there is for Frenchmen claiming to be the inventors of the locomotive engine.

A locomotive engine that worked successfully was made by Cugnot, in France, as early as 1769, but it is doubtful if its construction influenced in any way the inventions of Trevithick or Hedley, and Frenchmen do not attempt to take special credit for Cugnot's engine, because the invention was not followed out to a commercial success by their countrymen.

Although it is probable that bogie trucks were used under coal cars about Newcastle, in England, before locomotives were made a successful tractive power, there is no trace of evidence that they were resorted to as a means of shortening the wheel base of a locomotive till John B. Jervis designed a locomotive in this country, about 1832, with the front end carried on a four-wheeled truck. And there is no reason to believe that the engineer who designed this improvement was aware that bogie trucks were used under old English coal cars. It is certain that English locomotive designers did not discover the advantages of the engine truck till it was forced upon their attention by its remarkable success on American railroads.

So late as 1845 heavy fast passenger engines were built for the Great Western Railway of England which had two pairs of leading wheels, a large pair of drivers, and a single pair of trailing wheels, all fastened on a rigid base. The long rigid-wheel base was found a great drawback to the working of

the engines. Had English engineers been familiar with the separate leading truck at that time, there is no doubt but what it would have been adopted on the Great Western locomotives. English engineers deserve great credit for numerous improvements, which served to render locomotives and rail roads commercially successful, but they should be satisfied with what belongs to them and not lay wholesale claims to other men's inventions.

What Engineers Must Know in British Columbia.

The genial and active member of the firm of Manning, Maxwell & Moore, of this city, Mr. Charles A. Moore, has recently returned from a trip through British Columbia. While there he obtained the following copy of an official examination and instructions to engineers for the Puget Sound District, which he has kindly handed to us for publication in the AMERICAN MACHINIST:

ENGINEER'S CATECHISM—DISTRICT OF PUGET SOUND.

Chinook, with free construction into English.

Mika nanich ocook glass? Narwitka.
Do you see that glass? Yes.

Mika nanich chuck midlite? Narwitka.
Do you see the water inside? Yes.

Hias close spose chuck quanisome midlite carqua?
Very good, suppose the water always remains as it is?

Wake tickee chuck charcoe sockilee.
Don't want the water to get any higher.

Spose chuck charcoe keekquilee? Delate mamook poo pe go to hell in a minute.
Suppose the water gets low? Blow up sure and go to hell in a minute.

Quanisome close nanich pump pe close nanich chuck.
Always look sharp at the pump and look sharp at the water.

Quanisome mamook skookum pire.
Always make a hell of a fire.

Delate hias close.
Everything will be all right.

Mika cumtup? Narwitka.
Do you understand? Yes.

Any person not having a thorough knowledge of Chinook, and not answering the above questions correctly, will be considered disqualified for the position of engineer for the District of Puget Sound.

B. S. MILLER,
Local Inspector.
Nov. 17, 1883.

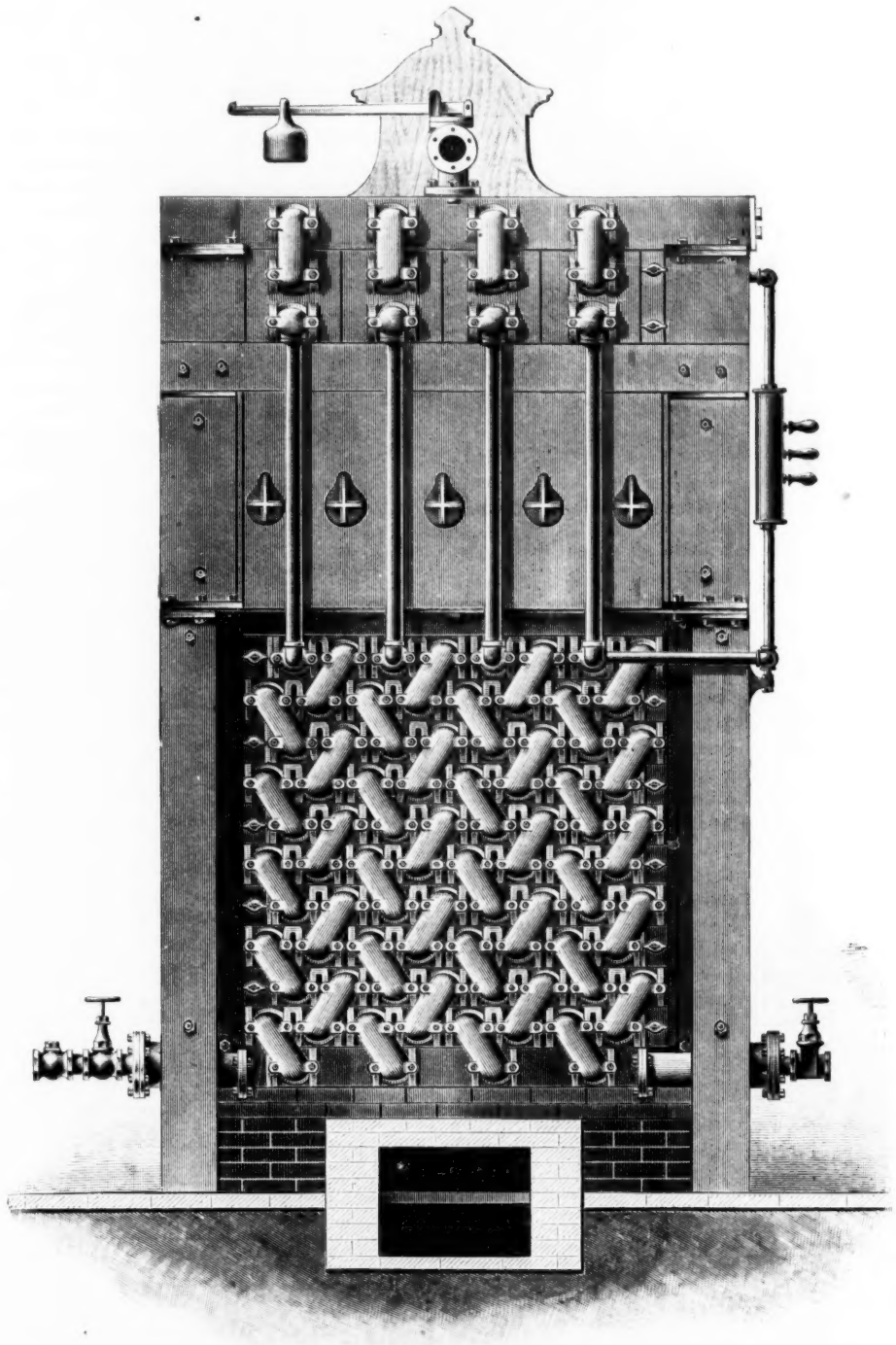
A press dispatch from Pittsburgh says: "A machine has been invented for the manufacture of hob nails, the work hitherto having been done by hand, and a factory will shortly be established in this city. It is claimed that the machine is capable of doing the work of 100 men, and as the manufacture of hob nails by hand is engaged in by thousands of men at present, the invention will result in throwing out of employment a large number of men throughout the country.

Each machine is operated by three men, and has a capacity of a ton per day." From this its value may be estimated.

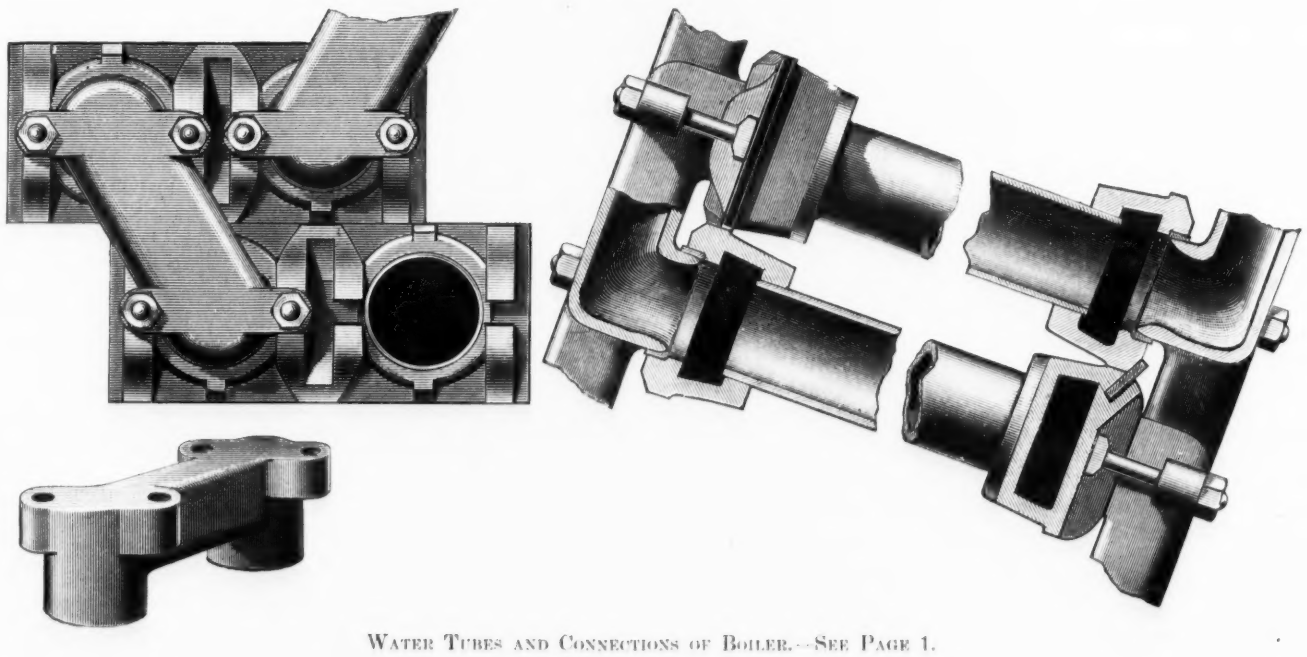
A New York *Sun* reporter has interviewed a trackman in one of the "box-like houses" on a railroad near New York City. The man was paid the munificent sum of $1 a day to attend to his duties in the box. He said to the reporter:

"I guess I about live here. I'm here about nineteen hours out of the twenty-four, and have ter keep awake all the time. 'Twouldn't do, yer see, ter go ter sleep and have a train run in upon me. That would settle me and bust the job. From 12½ A.M. to 5½ A.M. I get a chance to go home and see my wife and the kids. That's the only time I ain't on duty, and I sleep some during the visit."

The safety of passengers depends upon men in such places keeping awake and active. Yet when a fatal accident occurs by reason of one of them going to sleep, the whole blame is heaped upon the worn-out watchman, and the railroad company is excused because its employe did not obey instructions to keep awake and work the signals. The State of New York has a Board of Railroad Commissioners.



REAR ELEVATION OF ROOT BOILER.—SEE PAGE 1.



WATER TUBES AND CONNECTIONS OF BOILER.—SEE PAGE 1.

What do they propose to do about reforming such practices on the part of super-economical railroads?

The Bradford Railroad Accident.

One of the most dramatic accidents that ever happened in railroad operating occurred with a train on the Bradford, Bordell & Kenzua Railroad. A passenger train ran into a stream of oil escaping from a ruptured oil tank which stood near the track, the oil ignited by the locomotive fire, and instantly the whole train became enveloped in a cloud of flame fed by the oil scattered by the revolving wheels. There was a descending grade at the place, and the engineer appeared to lose control of the train for it rushed along at a destructive speed, which ended by the engine jumping the track at a sharp curve, wrecking the train. Threatened with the cruel death of roasting alive, many of the passengers chose the alternative of jumping from the train as it sped to destruction. A heavy covering of snow on the ground served as a soft bed to jump into, and most of the people who took the leap escaped with slight injuries. But for the snow most of the passengers who jumped from the train would have been fatally injured. As it was, four or five persons lost their lives in the accident, and over twenty were badly injured.

Locating oil tanks in such a position as to deluge the track with this inflammable material was an act of criminal recklessness. There seems to have been no proper braking power on the fatal train or it would not have got beyond control of the trainmen. Several severe railroad accidents have occurred lately where the engineer had to call for brakes, a sure indication that the hand-brake is still doing duty.

Scattered amidst the inlets of Puget Sound in Washington Territory, there is a sparse population which is said to be as frugally fed with spiritual nourishment as the pagans of Greenland's icy mountains, or India's coral strand. The Rev. Ludlow, of Olympia, proclaimed to the world the religious destitution of the Puget Sound region, and asked the righteous to subscribe the means which would enable him to build a small steamboat in which he could go from cove to inlet preaching the Gospel to the benighted people. Appeals of this kind are seldom made in vain, and contributions to the missionary fund were liberally forwarded. The boat was built and equipped, and, instead of going to spread the Gospel, the Rev. Ludlow is looking out for ships to tow. He has turned the missionary boat into a regular tug, and protests against the infamous transaction are met by the query, "What are you going to do about it?"

The total number of blast furnaces in Great Britain is 910. Of these 524 were in blast, and 386 out, on the 1st of November last, against 571 in blast and 345 out, on the 1st of November, 1882.

The aggregate earnings of 78 railroads for the first ten months last year were $332,468,901, or 10½ per cent. more than last year, while the earnings per mile are the same as last year.

Barnes' Improved Spiral Sleeve Friction Clutch, Pulley and Coupling.

In this device the gripping power is applied to the turned hub of a pulley, or outside diameter of a coupling, and is so designed as to be applicable to any pulley, by simply affixing a suitable hub.

Referring to the engraving, *A* represents the pulley, *B* the spiral sleeve or spring, *C* the cylinder, carrying the operating lever, and affixed firmly to the shaft by the set-screw *F*; *E* represents a movable thimble, with circular slot, in which the forked arm for shipping is fitted, and beneath *C* is the screw for regulating the amount of frictional resistance.

The operation is as follows: The spiral sleeve of cast-iron or, in case of extra severe duty, of cast steel, is bored to fit freely on the turned hub of the pulley *A*, the whole being enclosed by the cylinder *C*, through a slot in which the projection cast on the sleeve passes. The tapered end of the lever *D* engages with this, and by sliding the thimble forward or backward, in case two pulleys are used, the spiral sleeve (which is prevented from turning by the adjustable screw) is lightened on the hub of the driving pulley or coupling with any required amount of force. As the friction increases as the square of the number of coils used in the spiral sleeve, the driving power is limited only by the strength of materials.

When used as a cut-off coupling a suitable drum or cylinder is keyed to the driving end of one of the shafts to be connected, the other parts being similar to those employed when a pulley is used.

Some of the advantages of a good friction pulley may be summed up as follows, viz: Only one-half the usual width of pulley space is required, and as the belts are not shipped or moved edgewise, all wear from this cause is avoided, and machines may be started and stopped much easier and quicker, and without noise.

By their use on a milling machine, cutting-off machine, or other tools where cones are employed to increase or diminish speed, a pair of these pulleys, of different diameters, but with belts running in the same direction, enable the operator to secure double the number of speeds without the intervention of gearing.

The one here shown appears to be simple in construction, requiring no special tools in its manufacture, and having no parts liable to cause trouble.

The manufacturers are Barnes & Ross, Hyde Park, Mass.

The Equidistant Series of Gear Cutters.

BY GEO. B. GRANT, BOSTON.

There seems to be a difference of opinion, and of practice, also, concerning the proper number of gear cutters in the full series. Some makers use eight, others require twenty-four to the set, while none attempt to give a reason why one number is better than another, except the obvious one that the more there are the better. I am aware of no published investigation of the theory of the subject.

These tools are so expensive that it is a matter of considerable importance to determine just how few can be used with a proper respect for accuracy, and it is not best to be subject to any one's unsupported opinion in a matter that can be measured in every detail.

Each cutter is supposed to be correct for a medium position in its own interval, or part of the series, and to create an error in the shape of the tooth, measured by the error in the position of the point of the tooth, when used at either end of the interval.

In the figure, *a* is the point of the epicycloidal tooth of a rack, and *b* the point of the tooth of a pinion of twelve teeth, with radial flanks. The actual distance from point to point, in a straight line, is exactly:

$$a\,b = \frac{.36476}{p} \text{ inches}$$

or a little more than one-third of an inch for one diametral pitch, and proportionally less for finer pitches.

If we use c cutters, this distance is divided into $2c$ equal parts, and we have

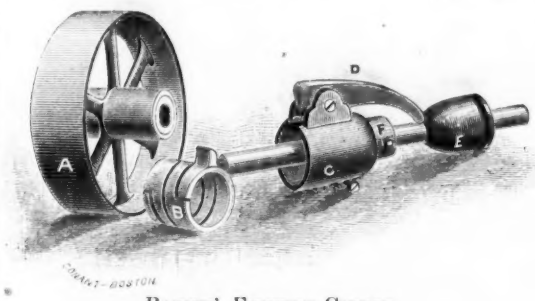
$$\text{error } e, = \frac{.36476}{2c\,p} = \frac{.18238}{c\,p} \text{ inches}$$

which is the amount of the greatest possible theoretical error in the position of the point of the tooth.

If we use eight cutters, as is the most general practice, we have

$$\text{error } e = \frac{.18238}{8\,p} = \frac{.0228}{p} \text{ inches}$$

and for various pitches this becomes



BARNES' FRICTION CLUTCH.

For 1 pitch, $\frac{1}{44}$ of an inch,
" 2 " $\frac{1}{88}$ " "
" 4 " $\frac{1}{176}$ " "
" 8 " $\frac{1}{352}$ " "
" 16 " $\frac{1}{704}$ " "
" 32 " $\frac{1}{1408}$ " "

If we use twenty-four cutters, the error will be one-third of that for eight cutters, and the rule is the same for other numbers.

So much for the theory, but this question cannot be settled by theory alone. It is evident that it depends not only on a proper arrangement, but also upon the accuracy attainable in the making of the cutters, or in their setting and adjusting in use. Even if the cutter could be shaped with perfect accuracy, it will warp in hardening, cannot be sharpened, or set in its place on the gear-cutting engine with perfect accuracy, and these practical and unavoidable errors will balance any great refinement that may be attempted in the mathematical theory.

I have never examined a cutter that was not provably "out of round," or that did not "wabble" on the arbor perceptibly, and it is certainly not worth while for the machinist to measure his theory by a thousandth of an inch, more or less, until he can work to within a reasonable distance of that limit, and he cannot now do it in this connection.

If we assume that the cutters can be made and handled with an accuracy of within $\frac{1}{n}$ of an inch of the truth, we can determine just how many cutters are necessary, for we have

$$\text{error, } e, = \frac{1}{n} = \frac{.18238}{c\,p} \text{ inch,}$$

and from that

$$c = \frac{n\ .18238}{p} \text{ cutters.}$$

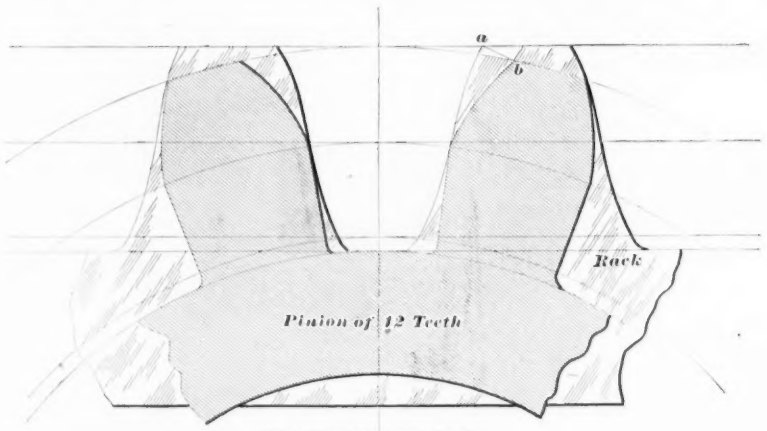
For example: If we are confident that we can work to within one five-hundredth of an inch, which appears to me to be the most reasonable extreme limit, we put $n = 500$, and get $c = \frac{91.2}{p}$ cutters; or,

91 cutters for 1 pitch.
46 " " 2 "
23 " " 4 "
11 " " 8 "
6 " " 16 "
3 " " 32 "

It would appear from this reasoning that, contrary to the general opinion and practice, there should be different numbers of cutters for different pitches, and that eight—the usual number—is not close enough for cutters larger than ten pitch. This agrees very well with my practice, for I find that there is no difficulty with eight cutters of ten pitch, but that on coarser pitches there is some trouble when the cutter is used at the extreme end of its interval.

Combining theory and practice, and giving each a share in the decision, it is evident that the most satisfactory arrangement would be,

6 cutters for 16 pitch or finer.
12 " " 8 to 16 pitch.
24 " " 4 " 8 "
48 " " 2 " 4 "



The Equidistant Series of Gear Cutters

FULL SIZE FOR EPICYCLOIDAL TWO DIAMETRAL PITCH. *The radius for the curve of the pinion is* 1.17 *inch, and for the rack* 1.55. *The center is* .07 *inch below the pitch line for the pinion, and* .20 *inches above or below the pitch line for the rack.*

Growth of Kentucky Industries.

In a recent issue a Kentucky paper asserts that a revolution of opinion in regard to industrial matters is quietly going on in that State. Ten years ago the man who would undertake to manufacture an article was looked upon as a scheming Yankee, not worthy of much credit or confidence. Tobacco was king, and unless a man raised a crop of that favored plant he was regarded as of no account. This is now changed, and diversified industries are obtaining respectful recognition not only in the cities but also in the rural districts. People have commenced to realize that there is wealth in the mine, the forest, and in the well-cultivated truck patch, and that a man may be quite respectable if he works in any of these lines of business. Cotton factories are attracting capital, mines are everywhere being opened up, the forests are being utilized, and new railroad lines are connecting the rich and hitherto undeveloped sections with the great commercial centers of the world. As a result of this commercial awakening immigrants are pouring into the State, and the people are preparing to meet the improved social conditions by expanding the educational facilities of the State.

The system of the cantilever as applied to bridge construction, which has been so successfully carried out on the new bridge over the Niagara River, was first brought into prominence by its adoption for the great bridge across the Firth of Forth in Scotland. This bridge, when completed, will be one of the greatest engineering enterprises ever carried out. The bridge proper will be over a mile long. Two spans will each be 1,700 feet long, and their height from the water will be 150 feet. Steel performs a leading part in the structure, the greater part of the girders and the cantilevers being of that material.

The *Springfield Republican* says: "Richard Conlan and Thomas Duncan, employed in Farnsworth & Marshall's foundry at Fitchburg, Mass., were victims of a curious accident Monday night. While carrying outdoors a ladle holding 150 pounds of molten iron, they slipped on some ice and upset the ladle. A cannon-like explosion followed, windows were broken in the vicinity and the two men were hurled over a rod, both being seriously hurt. Not a drop of the metal could be found after the explosion."

A device is being tried on engine 322 of the Elevated Railroad, to inject a supply of air on the fire when steam is shut off. Two holes about three inches diameter are cut in the back of the fire-box, one at each side of the door. Into each hole a small steam jet is secured, which receives steam through a pipe whose stop valve is operated by the throttle lever. When the engine is working the jets are closed, but when the engineer shuts off steam from the cylinders with the throttle lever, the valve supplying the steam jets is opened automatically. The air thus thrown upon the surface of the fire consumes the smoke and gases that are so often troublesome to passengers when an engine is running with the steam shut off. The device is very simple, and does its work effectually on this engine.

It is well known that aluminum would be a very useful metal for many artistic and mechanical purposes if it could be extracted cheaply from aluminous earth. A patent has recently been granted to W. H. Brown, New York, for an improved method of obtaining aluminum. The process consists of mixing aluminous ore or earth and an ore of zinc with carbonaceous material and a flux, and subjecting the mixture to heat in a closed retort, whereby the zinc liberated is caused to assist in casting down the aluminum in a metallic state, producing an alloy of zinc and aluminum. The process will be important if it should prove successful and cheap.

In a letter from Prof. Morris, of Cornell University, recently published in the AMERICAN MACHINIST, the types made it appear that their foundry is 380 feet wide. Thirty-eight feet and six inches is the correct measurement.

Locomotive Engineers' Meeting.

On Wednesday, January 9, the New York City Division, 105, of the Brotherhood of Locomotive Engineers, had their annual ball in Tammany Hall, New York. There was a large assembly of the engineers and their friends present. The engineers from various roads in this neighborhood make this ball the occasion for annually meeting to spend the evening with old acquaintances of the throttle. While the younger members tripped the light fantastic toe the veterans congregated in the boxes and side rooms of the hall, and many a tough yarn of railroad experience was spun over again.

The Brotherhood of Locomotive Engineers is in a very flourishing condition all over the country. The organization now consists of 237 divisions, scattered all over the United States and Canada. The insurance part of the brotherhood has done immense service in providing aid to those suddenly deprived of the bread winner by the accidents which prove so fatal to locomotive engineers.

The Foreign Exhibition, which was opened in Boston, September 5, was informally closed January 12. It was a financial failure, the deficit being placed as high as $50,000. The exhibits were turned over to Customs officers, who took charge of the building.

Henry R. Holbrook, Pueblo, Colorado, has patented a tubular metallic tie of elliptic sections for railroad tracks. The tie is reenforced at the points where the rails connect, and proper means are provided for fastening the rails. There is talk of the steel works in Pueblo going into the rolling of this form of railroad tie.

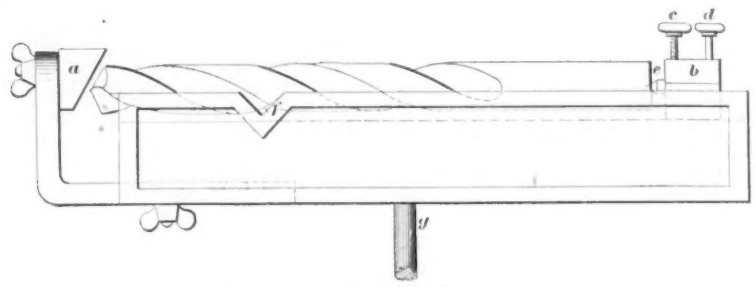
Prankard's Twist Drill Gauge.

This gauge is the invention of Charles Prankard, tool-maker at the Tolhurst Machine Works, Troy, N. Y.

The essential features are visible at a glance. The principal casting, which is paneled at the sides to make it lighter, has a right-angled V planed in the top to its full width, into which the drill is laid and the accuracy of the lips gauged by bringing them successively before the beveled edge of the adjustable piece *a*. The block *b* is movable along the V, to suit drills of different lengths, and is clamped in the proper position by a screw at the back end. Minute adjustments of the centre *e*, against which the drill is backed, are made by the milled head screws *c* and *d*, *c* adjusting it vertically and *d* advancing or withdrawing it.

If the lip of the drill is very nearly in contact with the gauge face *a*, as it should be for accurate work, it is necessary, in rolling the drill over, to allow it to move backward from the gauge so that the points will pass. For this purpose a spring is provided in the centre *e*. The notch *f* is for convenience in picking up the drill. The gauge may be placed as most convenient, say clamped to an emery grinder by means of the rod *g*, bringing it up to about the height of the eye, with, if possible, a window before it.

We are informed by F. H. Richards, foreman at the works previously mentioned, that they have this gauge in use, and that it is in every way satisfactory as an aid in grinding twist drills, by its use drills being ground with the greatest degree of accuracy. Mr. Prankard has control of the invention.



PRANKARD'S TWIST DRILL GAUGE.

sion of water when it freezes, the effect of which is to burst the pipes. Now, while we cannot change a law of nature, I am certain that very many of your readers will be glad to know of a method of counteracting such effects.

For many years I have had the water pipes in my door yard, which I only use for irrigation in the summer season, left entirely naked during the winter seasons, and have not had a pipe burst. Many have been the wondering inquiries how I kept them from bursting, and as the method is no secret, and so far as I know not patented, I will explain, and I have no doubt that many of your readers can apply the remedy to great advantage.

In a $\frac{3}{4}$" pipe I use a piece of $\frac{1}{8}$" rubber tube. Through the rubber tube I run a piece of stove-pipe wire to stiffen it. Use a piece of rubber tube long enough to pass through all of that portion of the water pipe which is liable to freeze. With a strong thread tie each end of the rubber tube tight around the stiffening wire, and run it into the water pipe. When the water freezes it will compress the air in the rubber tube, instead of splitting the pipe. Water pitchers and other vessels containing water can be protected from bursting by using a coil of rubber tubing inside of them. The tube should be so arranged that a part of it will come in the center of the vessel.

GEORGE B. FOOTE.

Helena, Montana.

Adjustable Attachment for Plumb Rules.

Editor American Machinist:

Permit me to offer, for the use of the boys, a new rig I have lately devised. It is an adjustable attachment for plumb rules, and the manner of using it will be readily understood from the engraving, in which *b*, *b* are two plates, exactly alike as to length, their ends being filed or turned to a common radius, with *g* as a common center. The centers, *g*, *g*, are bored through; diameter of holes, about $\frac{3}{64}$". Besides the center hole, the upper plate has three other small holes through which the line is drawn, shallow grooves being cut on the back of plate between the holes, so as to clear the line.

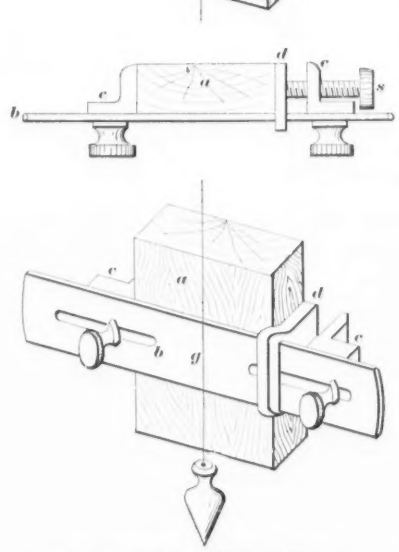
Adjustable knees, *c*, *c*, *c*, *c*, are clamped to the plates by the milled screws, and loose sliding plates, *d*, *d*, are interposed between the rule, *a*, and the clamp screws, *s*.

The knees on the left, and also the loose plates, *d*, are furnished with two sharp points each, so that the attachment can be fastened on the rule with very little pressure.

It will be seen that the rod or rule, *a*, needs no planing or other preparation, and may even be the reverse of straight. The ends of the plates, *b*, being segments of a circle of which *g* is the center, a bend in the rod does not affect the accuracy of the work done. Plane the edges of the plates parallel, and they serve for parallel straight-edges. Graduate the lower plate each way from the center, *g*; then, by setting the plates any known distance apart on the rule, it can be used as a batter rule. The dimensions of the ones I use are: Plates, *b*, 8"x1$\frac{1}{2}$"x$\frac{1}{8}$", steel; knee plates of 1", L-iron; loose plates, *d*, $\frac{1}{8}$" steel; all screws, $\frac{5}{16}$" diameter.

The attachment takes up little space in the tool chest, and does away with the necessity for frequent trips to the pattern shop.

Leadville, Col. ANDREW WALLACE.



ATTACHMENT FOR PLUMB RULES.

New Steam Plow.

Editor American Machinist:

In your last issue I notice an article on steam plows. Coming across a new patent steam plow in a machine shop here I thought I would tell you a little of its design. The frame is oblong, and carries a gang of four 16-in. plows on each end. The boiler is an upright one and swings in the center in a large ring on trunnions. The ring swings in bearings in the frame, so that it does not matter which way the frame is on hilly ground or side hill, the boiler is always upright. There are four large wheels: two are fixed and two are run on a swivel, for steering. The four wheels are connected by chains, getting power on them all. The inventor claims that driving the four wheels has overcome a great failing in other steam plows, on account of not having enough traction on the ground. The machine has four wheels, which are of a novel construction, for applying power to the ground, and seem to me to work very satisfactorily and effectively. They have hollow spokes, and bars regulated by a cam slide pass through the spokes. This cam forces the spokes down hard on the ground, and prevents slipping. This seems to me to be a novel and successful feature. The bars draw in as the wheels go forward, so that the face of the wheel can be scraped clean every time it goes round, so that the wheel cannot slip the width of face of wheel.

It is governed by the number of plows used, also the width of the bars. When the machine is on hard ground the wheels are changed to a smooth face, as the machine or plow travels without stopping. This seems to me to be the most perfect-looking machine that I have ever seen. The plow's weight is 4,000 lbs. The plow is being made at the Malleable Iron Works, Keokuk.

JOHN BEEZLEY.

Keokuk, Iowa, Jan. 7, 1884.

A Small Shop Man in a Large Shop—Reaming Pulleys.

Editor American Machinist:

In a previous letter I spoke of removing from the small to the large shop. I had not been in the large shop a very long time when I had the job of boring and finishing a lot of rather light 22" pulleys. A chuck lathe was assigned as the place to do the boring—chuck drills, reamers, and arbors, I knew, were kept in the tool-room. There was nothing new, nor strange to me about this job, or the tools, excepting the tool-room itself. (This shop had a tool-room and a tool-keeper, certainly as early as 1852, and, if I mistake not, the tool-room was instituted by Mr. J. C. Hoadley, now of Boston, Mass.) I soon had one pulley bored, and was about to take it from the lathe, when one of the workmen told me that it was the custom there to ream pulleys, in the chuck, by power; and also said that I would have very hard work to ream them by hand. I did not like this plan. By precept and experience I had already learned that to ream or tap holes by power, with the work in the chuck, was a dangerous operation. Dangerous to the tools, to the work and to the workman himself. I found there was more stock to ream than there ought to have been, but I wanted to get into big shop ways and do as others did, so I clamped the reamer back against the dead center, and began to break pulleys. Of that lot of about a dozen I twisted the arms out of four. There were just four more in stock, and when I had the last one bored I determined not to risk it in the chuck, and took it to a vise to ream by hand. It was very hard work, because of so much stock to come out, and finally the pulley slipped from the vise and was broken by the fall.

I was vexed and chagrined; but, not discouraged or disheartened. Misfortune had come, but I was just as good a man, just as good a mechanic, as I was before, and it was a relief to know that the climax of misfortune in that job was reached. The smiles of some of the workmen made me feel indifferent to criticism, and gave me an independence of spirit, that I had not known before.

CENTRAL PACIFIC RAILROAD.—Statement showing performance of Four Engines pulling Freight opposite each other between Oakland and Sacramento. Month, August, 1883.

Number of Engines.	Maker.	Size of Cylinders. Diam.	Stroke	Number and Size of Drivers. No.	Size.	Weight of Locomotive and Tender with Fuel & Water. Lbs.	Weight of Locomotive on Drivers. Pounds.	Square Feet of Heating Surface. Tube Area.	F'e-box Area.	Total.	Square Feet Grate Area.	Maximum Lbs. Steam.	Locomotive Mileage. Train.	Way Swtc'g	Total.	Fuel Consumed. Tons Coal.	C'rds Wood	Water Evaporated. No. Gals.	Lbs. to 1 lb. Co'l cons'd	Average Number Cars per Train. Loaded.	Empty.	Total	Average Wt per Tr'n in Tons.	Miles Run to One Ton Coal. Incl'g Swtc'g	Exc'ng Swtc'g	Tons Hauled 1 Eng. Mile to 1 lb. Coal Consumed.
C. P. 34	Norris.....	17	24	4	4' 6"	128,460	38,210	812	100	912	14.8	125	2828	216	3044	149.3	5	167,547	4 66-100	40 4-10	13 4-10	53 8-10	1022	19 9-10	18 4-10	9 49-100
36	Rogers.....	17	24	4	4' 8"	136,180	46,840	1023	93	1116	14.7	125	2808	112	2810	111.3	4.3	142,203	5 30-100	37 1-10	19 3-10	56 4-10	1072	24 4-10	23 5-10	12 57-100
48	Stevens....	17	30	4	4' 6"	166,100	51,900	753	156	909	24.6	130	2957	300	3257	67.3	5.3	108,500	6 67-100	49 2-10	16 5-10	65 7-10	1250	45 5-10	41	25 84-100
186	C. P. R. R..	17	24	4	4' 8"	132,990	47,550	874	95	969	14.1	125	3004	18	3022	169	5.3	124,111	4 71-100	41 6-10	9 1-10	50 7-10	965	26 5-10	26 4-10	12 77-100

Comparison on Coal Consumed.	Engine Miles Run to One Ton Coal Consumed.	Tons Hauled. One Engine Mile to One Pound Coal Consumed.
Engine No. 48 in excess of Engine No. 34	123 per cent.	172 per cent.
" " " " " 36	75 "	105 "
" " " " " 186	55 "	102 "
" " " " average of three engines	80 "	122 "

Relative Efficiency.	Engine Miles Run to One Ton Coal Consumed.	Tons Hauled. One Engine Mile to One Pound Coal Consumed.
Taking Engine No. 48 as a standard of	100	100
" " " 34 relatively is	45	36
" " " 36 "	57	49
" " " 136 "	65	49
The average of three engines relatively is	56	45

Coal: Bituminous, 2,000 pounds per ton.
Wood: Pine, used for kindling; 1½ cords equals 1 ton coal.

In average weight of trains shown above, weight of engine and tender is not included.

LETTERS FROM PRACTICAL MEN.

Performance of Stevens' Locomotive.

Editor American Machinist:

In my letter of November 25th I promised to send you a statement of the performance of Engine 48, fitted with my valve gear. Today I send the copy referred to. I think it speaks for itself. With reference to this report, I might add, that it has not been doctored in any way to favor the engine, but the figures are taken from the auditor's books.

The runs made were over two different routes between Oakland and Sacramento: One via Benecia, which is 84 miles long, with maximum grade of 52 feet and curves of five degrees. The card time on this run averages 9½ miles an hour, which includes time for crossing straits at Port Costa, one mile on ferryboat Solano, which averages one hour. It also includes two stops at drawbridges, and time consumed in running at limited speed through four long yards.

The other run, via Martinez, is 145 miles long, with maximum grades of 39.60, and curves five degrees. The card time on this run averages 14.20 miles an hour, which includes stops at three drawbridges, also time consumed in running at limited speed through four long yards.

A. J. STEVENS,
Gen'l Master Mechanic, C. P. R. R.

I was not so anxious to get into big shop ways as I had been.

I knew that in the little old shop which I had left, if I had found a drill was too small for a reamer, I would have used some judgment, and corrected the fault.

I knew that if a hole was true, and of such size that a reamer would have only to perform its proper office of just scraping the surface; if the reamer was firmly clamped back on the dead center so that it could not "hug in," and kept well oiled and did not get stuck; if the feed were neither too fast nor too slow; in fact if everything was just right and would remain so, holes could be reamed by power with the work in a chuck, but I had made a failure of it, and expected to be discharged.

I told the foreman that I had broken five of the pulleys, and supposed he would not have anything more for me to do. He told me it was not worth while to give it up so, but to go on with the turning. When the odd pulley came in, on enquiring at the tool room, I found a drill suitable for the reamer; but I reamed that pulley by hand.

OLD JOUR.

Intelligence in Melting.

BY THOMAS D. WEST.

There probably has at no time been the thought given the subject of melting that is given it at the present time. A few years back there were more superstitious melters than intelligent ones. In fact there can, at the present day, be found men who look upon the cupola as something more supernatural than mechanical. If anything goes wrong, they give an inquirer a look, as much as to say, "question the gods." Dull iron one day, hot iron the next, and a bunged cupola the following day, may be excusable in some shops, but to the intelligent founder of to-day such workings are connected with cause and effect, and a want of knowledge.

The cupola can easily be the master if one does not strive to master it. To master the cupola is simply to have it do as one may wish. Hot iron one day, dull another, three or four different grades got out without being mixed; heavy scrap run down, and fast or slow melting are points that can be, and are, mastered by intelligence. It may be a broad assertion, but nevertheless the writer would say that in no part of foundry practice is there a better chance to control results than in melting. The chances are far more in favor of a first-class moulder having bad results with his work than he would were he a first-class melter. Any mechanic well versed in both branches, I think, will verify this statement.

Having lately made a tour through many States, I was much pleased to see with what interest many foundrymen, who, by the way, were readers of the AMERICAN MACHINIST, and "Foundry Practice," had taken up the subject of melting. Right here I would like to say that although there are those who sneer at foundry literature, a travel through the country will prove that the most intelligent and progressive moulders are those who read it. It is not always the information we get from reading that measures its value, but the thinking it induces us to do.

Among the most intelligent cupola managers, the question of economy in fuel is the all-important one; so important with some that it reminds one of the man who tried to learn his mule to live without eating. They keep striving until they find themselves the losers.

The readers will remember that nearly every cupola working, which I have given in the AMERICAN MACHINIST, has brought out sharp criticisms upon my extravagance in the use of fuel. Now, I know melting 1 to 8, or 1 to 9 or 10, reads nicely, but the criticisms so far only induce a smile.

This question of economy in fuel is a misleading one. With intelligent management, and conditions alike, two distinct foundries may melt with a like low percentage of fuel, but what may be economy for one shop may be quite the reverse for another.

Having, a year or two back, shown that the low percentage which might be successfully used in some shops would not be advisable for others, a discussion of these points will not be entered into here. But as one of the points which is here discussed is the fluidity of melted iron, I will assert that in no ordinary cupola, running at medium capacity, can iron be melted as hot with fuel 1 to 9 as with 1 to 5, 6 or 7. It may be thought that the iron is hot, but if it had to be carried as far as it must be in some shops, and then poured into castings about as thick as paper, it would be found that there was a difference in "hot iron."

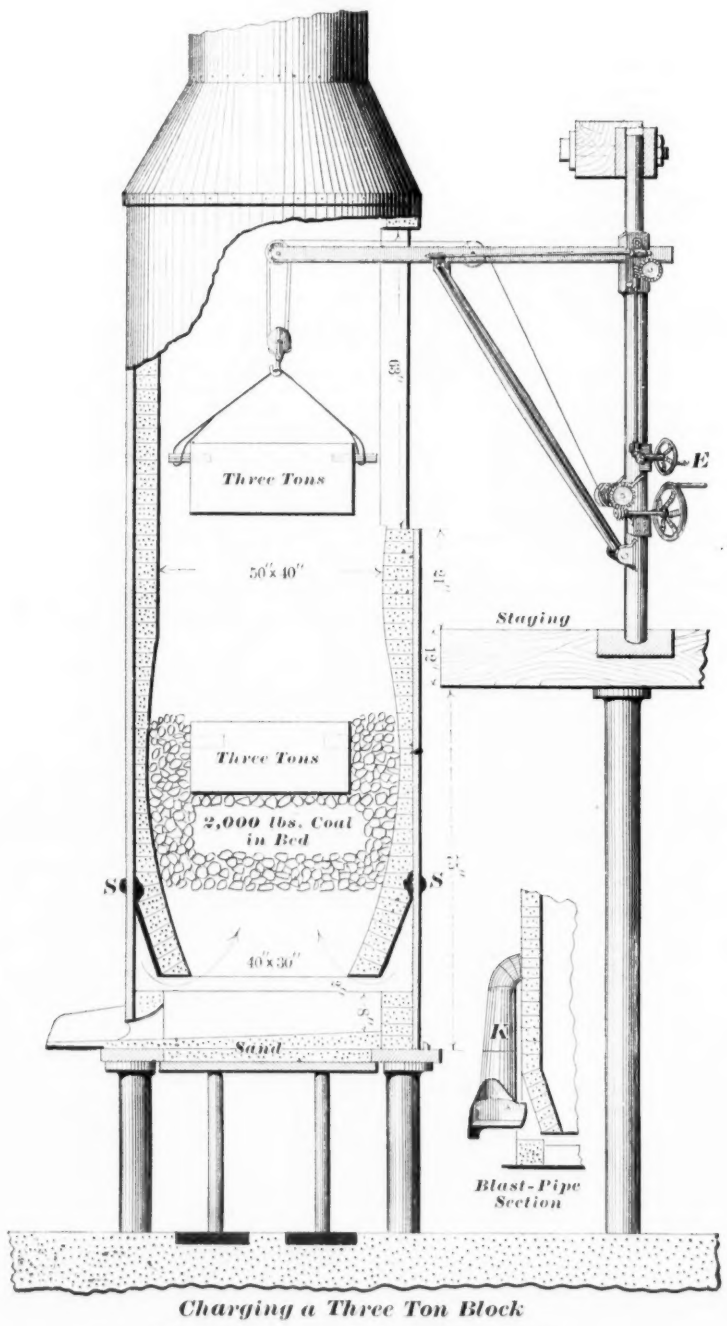
Of course the writer has no intention to disparage economy in the use of fuel, but the only way to judge of economy is to see the facilities of the shop and class of work to be made. For my part I would not question one to five as being extravagant until I knew all the conditions.

As a matter of fact, when all the circumstances are considered, iron is being economically melted from one to five up to one to eleven. To melt lower than one to eight is no doubt creditable, and a saving in the cost of melting, that is if by so doing the welfare of the cupola, ladles, and castings is not sacrificed; but were the facts known more cupolas would be found melting 1 to 5 than to 7 or 8. But there are many instances where facts cannot be given, as the fuel or iron is never weighed. In such the melting may or may not be satisfactory.

If one wishes to master melting he must weigh the fuel and iron, so as to have data from which to work. We also can then regulate our heats, and have a uniformity that it is impossible to obtain by guess work. Where cupolas are charged at random one may see the first of the heat bring down hot iron, the middle dull iron, and the end again hot iron. In others will be a half dozen changes of the fluidity of the iron, every charge seeming to make an alteration in this respect. Uniformity in melting requires the employment of system. With this one can have as hot or as dull iron as he may desire. With system we know how high a bed, and the percentage of fuel to use to assist the obtaining whatever fluidity of iron we require. By weighing all stock the cupola is as easily regulated as a clock. By not weighing the stock, it is about as hard to regulate as the weather.

In all well-managed foundries the subject of melting is looked upon as one of importance, and worthy of intelligent thought. During my late tour I was struck with the interest employers were taking in foundry matters. My attention was especially attracted to the cupola crane designed by Mr. Pratt, of the Pratt & Whitney Company, Hartford, Conn., for handling heavy blocks of scrap iron. Having read, sometime since, in the AMERICAN MACHINIST, of this firm melting a 6,000 lb. block of iron, I thought at the time there had been a mistake made, by adding a cipher; as the article did not describe how it was done, or any of the details, there was nothing to figure from. In talking with Mr. Gardner, the foundry foreman, upon the subject, he said it was a fact, and took me out to the yard where there was a duplicate of the 6,000 pound piece he had melted. I told him I thought he had melted the heaviest block that had ever been charged into a cupola, and asked his permission to describe the melting at length, as it was a creditable job, and would interest many foundrymen.

The cupola used was a Mackenzie, the size being as shown in the engraving. The process of melting was as follows: For bed, 2,000 lbs. of coal, on which was placed the three-ton block. Around this was placed 400 lbs. of coal, and the fire started. After it was well going the cupola was charged, to complete a heat of 22,000 lbs., by having four charges of 500 lbs. of coal and 4,000 lbs. scrap, and pig in each charge. The first 500 lbs. of coal was placed upon the 6,000 lbs. block, thereby burying the block in 2,900 lbs. of coal. The metal was used to pour a similar block, and a class of work which, had the metal been somewhat dull, the castings would run full. Although this class of work was selected, Mr. Gardner said the metal would have run lighter work.



Charging a Three Ton Block

PRATT & WHITNEY CO.'S FOUNDRY CUPOLA.

The fuel used for the above heat was one to five, this percentage being necessary by the requirement of an extra weight of fuel for the bed. For ordinary heats the bed is 1,500 lbs. coal, with the charges same as used with the block, so that for an ordinary heat of 22,000 lbs. the fuel would be 1 to $6\frac{28}{100}$. When this block was charged, the cupola was well burnt out. Had it not been, Mr. Gardner said, he could not have melted the block, as there would not have been room to properly bed it. For the purpose of admitting this block, the charging door was removed and enlarged so as to make it about the height shown. The crane's jib is racked out by the handle, *E*. The cut shows the block suspended, ready to be lowered down on its bed.

The charging of heavy scrap by hand and back-bone jibs is not only a laborious job, but it is injurious to the lining and bed, and iron can seldom be placed as one might wish. The way it is generally done is to let it drop from the charging door to the bed, which, in some cupolas, means a fall of seven or eight feet.

In most all trades, more or less consideration is given the comfort of workmen, such as facilities for properly handling material, but for us foundrymen anything is generally looked upon as good enough. Therefore, any device which inures to our comfort, such as this of Mr. Pratt, is looked upon with favor by all foundrymen.

In an article upon "Coke and Coal in Melting" (AMERICAN MACHINIST, September 15, 1883), I omitted to state an important advantage which coal has over coke. In the cut was represented heavy scrap, and it should have been stated that coal was better for melting such pieces than coke. Mr. Gardner could not have accomplished the successful melting of such a heavy block with coke. Outside the Cuyahoga Works cupola scrap-house can be seen a pile of heavy pieces of scrap dies ranging from 300 up to 800 lbs. in weight. To keep this pile from increasing, we are obliged to melt as many of these pieces as possible every heat. In charging them, we omit putting any in with the first charge, as to do so the height of bed would require to be increased. The first block will generally be placed in with the second charge; then, when it and the upper one come down, the cupola is hotter, and there is less risk of the heavy blocks sinking down below the melting point. With all coke for fuel, the blocks could not be melted as successfully as they now are by the use of coal, as was shown.

There are few foundries but have some heavy pieces of scrap they would like to get rid of, and would do so were they not afraid of bunging up their cupolas. I would advise such to follow Mr. Gardner's plan, or, if the pieces are lighter, to save fuel, they could place them in the second charge, and, if they thought it would damage their cupola, or make bad work, the bottom could be dropped, and what was left of the block could be charged in another heat. Such heavy pieces are best melted when one can arrange to have work that does not require the hottest of iron. Heavy scrap is far superior to light for making strong mixtures, and, although it takes more fuel to melt it, it may often pay in the end to do so.

There is an adage that "it is a poor foundry that cannot make its own scrap." The way some lose heavy castings one would think they were trying to supply their neighbors. The loss of heavy castings makes heavy scrap, and for some shops the above may suggest ideas to help them get it out of sight, and rid themselves of unpleasant memories.

A Busy Machine Shop.

The machine shop of Gould & Eberhardt, Railroad Avenue, Newark, N. J., does not seem to be at all influenced by the dull trade which has been widely complained of lately. A walk round the shop recently showed us a full force of men at work, and we were assured that the order-book did not give indications of any falling off. The work on hand consists mostly of their line of shaping machines and other small tools. There is a good demand for their automatic gear cutting machine, and there are several of them in the shop in course of construction. One machine was at work cutting a gear wheel 28″x4″, and its operation was simply perfect. After the blank wheel was put in the machine, the proper cutter selected, and the machine started, it required no more attention till all the teeth were cut, when it automatically rang a bell to call the attention of the machinist to the fact that another blank wheel was needed. This firm has been making gear cutting machines for many years. A silver medal in the office, marked American Institute, 1851, tells that it was awarded to E. & S. D. Gould for a compound planing machine, wheel tooth cutting engine and vertical drill. This indicates quite a change in machine nomenclature in thirty years. When the medal was given, a shaping machine was a compound planing machine; a gear cutter was a wheel tooth cutting engine; and a drill press was a vertical drill.

A very good practice followed with the lathes used in this shop is, having the Vs covered with a brass shield, which moves along with the slide-rest. In moving heavy work in or out of the lathe, this shield receives any dents, which are otherwise apt to be borne by the Vs. We were struck with the 16″ lathe built here as being a particularly handy tool. A positive feed arrangement is carried out very simply, and gives the operator the choice of using the screw cutting gear for feeding gear. A small dial, connected with a worm which acts on the bed screw, enables the workman to reverse the feed exactly at any point. This is done automatically, without the use of cross belt. The lead screw outside bearing has steel face and loose steel washer between the shoulders, to bear the thrust. This lathe has proved so stiff that parties have ordered it as long as 18 feet.

A new 15″ hand lathe, intended for rapid operations on light work, has some novel features. The casting of the tailstock is sloped concave from the outside, so that when a compound rest is put on to do taper work there will be more room for using the tool. There is a brake put through the base of the headstock, which applies on cone and stops the lathe instantly, an important point where a man is rushing through small work, such as brass fittings.

Four new planers have lately been put into the shop, to replace tools that have been running about twenty years. Two of the old planers were sold to go West, and brought good prices. A plain slide valve horizontal engine, which has been running the machinery in this shop for nearly 40 years, became too light for the work, and it has been replaced by a new engine, made by the Hartford Engineering Company.

During last year Gould & Eberhardt received the Portland, Oregon, gold medal for the best machine tools exhibited. At San Francisco they received the silver medal, which was the highest prize for machinists' tools made outside the State of California.

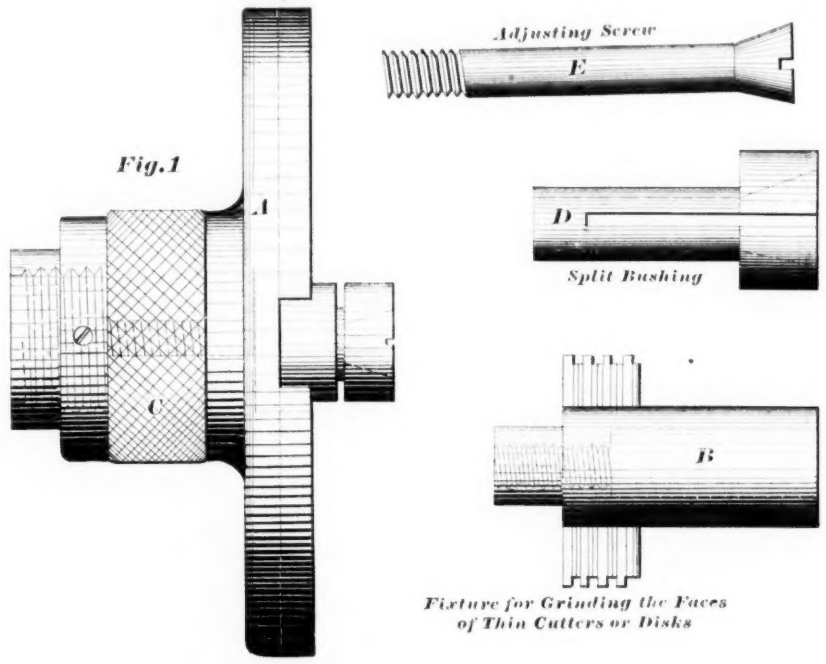
The Milling Machine; its Construction and Uses.

BY JOHN J. GRANT.

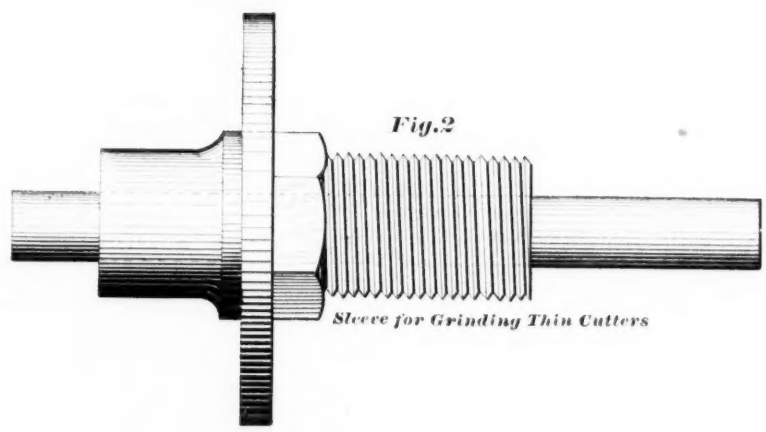
FIFTEENTH PAPER.

I have been accused by some of the readers of the articles on milling, of theorizing too much, and not coming down to real work. Now, I wish it to be distinctly understood that nearly every fixture and tool I have explained are in actual use, and are doing even more work than I have credited them with. Having been in the shop every day since I was old enough to handle the hammer and file, I believe I have seen enough of the practical part of the business to warrant me in saying that I take no stock in any theory in the mechanical line until it has stood the test of practical application. Any one thinking that the previous articles are not in every particular practical, can disabuse his mind, and at once proceed to put as many of the ideas as will suit his class of work into operation, knowing that they have all been tried and not found wanting.

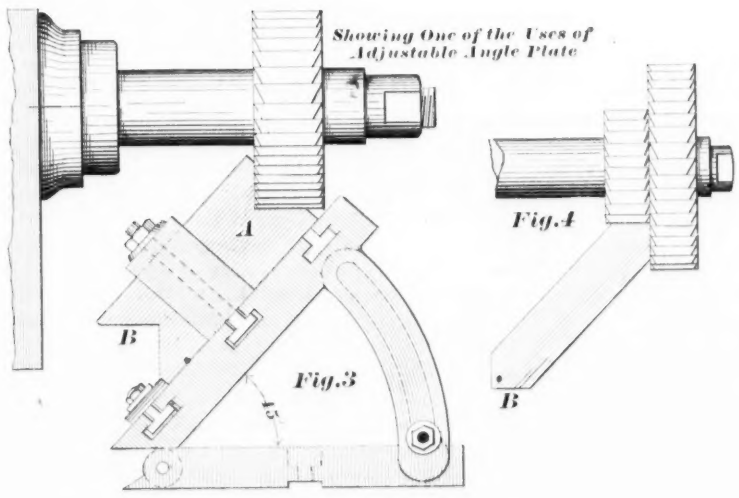
The cut, Fig. 1, shows a fixture for grinding a thin cutter, or any disk that is too light to be held on the arbor alone while grinding. This fixture is the one mentioned in my last paper. I think the arrangement is original with Messrs. Brown & Sharpe, as I have never seen one made by any one else on just the same principle. It can be used either on a lathe having a grinding attachment (which, by the way, no shop in the land should be without), or on a grinding machine. With the help of the cuts I think its construction will be made plain.



Fixture for Grinding the Faces of Thin Cutters or Disks



Sleeve for Grinding Thin Cutters



The body of the fixture, *A*, is made of cast iron, and fitted to the live spindle of the machine in the same manner as the face plate. It should be fitted as perfectly as possible, and for the ordinary sizes of work need not be over 6″ or 7″ in diameter, and about ¾″ thick. This face plate requires grinding off true every time that it is used for very accurate work, which is, of course, done when the fixture is on the machine. The hub on the back side should be about 2″ long by 2″ diameter. A slot is cut through it ¼″ wide and 1″ long. The front of the plate is counterbored out 1¾″ diameter, ¾″ deep. The slot runs through into this, and measures 2½″ across. This allows the wings on the sliding piece, *B*, to pass through, the ends of which are threaded to receive the threaded collar *C*. This collar is knurled on the outside to work by hand. Turning this collar moves the sliding piece *B*, back and forth. *B* is bored out to receive the split bushings. The end, *D*, of these bushings is made to fit the size of holes in the cutters to be ground, and can be changed in a minute for other sizes. The front end of the split bushings is bored out tapering, and a screw, *E*, having a tapering head, passes through them, and is tapped into the sliding piece *B*. The use of this screw is to adjust the split bushing to the holes in the cutters being ground. A collar is fitted into the counterbored place in front of the face plate, to prevent the sliding piece, *B*, from coming out; this also prevents dust and grit from working into the nut. A retaining collar is placed at the back of the knurled collar, to hold it in place.

To use the fixture, screw it on to the live spindle of the machine, turn the collar, *C*, so that the sliding piece, *B*, will be run out to the front, place the cutter to be ground on the split bushing, and with a screw-driver expand it to fill the hole, and hold it tight enough to prevent its turning when being ground. Draw the cutter back against the face plate by turning the knurled collar at the back, being careful not to spring it. The grinding wheel should be turned so that the arbor will be at right angles to the spindle of the lathe or grinding machine. After grinding one face true reverse the cutter, draw it to a full bearing against the face plate, and repeat the operation. With care quite a large thin cutter can be ground practically true with this fixture.

There are various other uses to which the above fixture can be put, which will certainly pay for making, as often the time consumed in trying to do such jobs and then not being successful will half pay for the fixture.

In grinding the cutting edges of the teeth on a narrow face cutter it is necessary to have a longer bearing than the thickness of the cutter itself, to prevent the cutter from tipping or cramping on the grinding mandrel. The sleeve shown in fig. 2 is used when cutters are less than about ¾″ thick. This gives a long bearing, and produces much better grinding than can possibly be done without it. The cut shows the construction very plainly, and it is only necessary to say that for cutters having a hole 1″ in diameter the hole in the sleeve should be about ¾″ and the jamb nut may be either squared for a wrench or knurled for the hand. As very few large heavy cutters, having a large hole, that are too narrow to grind on the grinding mandrel are used, a bushing can be made that will answer for them and one sleeve will answer for all sizes.

One of the uses to which the angle plate, shown in fourteenth paper, can be put is shown in Fig. 3. It is often necessary to mill a right angle-groove, as shown in the piece marked *A*, or to mill an angle on the edge of a piece, as in Fig. 4. With this fixture such jobs can be done with a common straight cutter. In Fig. 3 the cutter requires to be cut on the face as well as on the periphery. If the face, *B*, is not too wide a cutter used for cutting key seats will answer. In Fig. 4 two common cutters placed side by side, one being of enough larger diameter than the other to cover the face *B*, is all that is required. As the straight common cutter is less troublesome and expensive to keep in order, all these little kinks are worth remembering. The arrangement shows the angle plate thrown back at an angle of 45°, and the piece to be milled bolted to it. A parallel piece bolted to the angle plate at the bottom keeps the work level or parallel with the platen, and in case both sides are to be milled alike, no farther adjustment is necessary after one side is set, as by simply turning the piece end for end brings the opposite side in the same relation to the cutter.

One of the latest purposes paper pulp is turned to is to make piping for speaking tubes. It is believed that paper will be better for this purpose than metallic tubes. A patentee, who proposes using paper tubes in this way, intimates that metallic elbows and couplings will be used to connect the joints of the paper pipes.

A terrible accident happened in a blast furnace lately at Johnstown, Pa., which directs the attention of machinists to the necessity for ascertaining that there is no pressure of steam on a cylinder when work of taking off a head is begun. A gang of men started to remove the cylinder head of a large engine immediately after it stopped. The cylinder cocks were left closed, and the throttle being leaky, an accumulation of hot water soon gathered in the cylinder. When the bolts were loosened, the steam blew the head off, scattering the boiling water over the workmen. Several of them were dreadfully scalded. One man is almost certain to die, and others are in a very critical condition.

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☞ *We are not engaged in procuring patent rights, or in selling machinery, nor have we any pet scheme to advance, or hobby to ride.*

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NEW YORK, FEBRUARY 2, 1884.

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Effects of the Prison Contract System.

We find the following in a late issue of the *Troy Evening Standard:*

The moulders and stove manufacturers of the city have not yet come to any understanding as to a reduction of wages. The manufacturers, at a meeting held Saturday afternoon in the office of Fuller, Warren & Co., expressed themselves as not satisfied with a reduction of 10 per cent., as proposed by the moulders. They say they cannot reasonably revise their price lists with this reduction. The Troy and Albany manufacturers will meet in a few days, when they will appoint a committee who will confer with the moulders. It is said a number of foundries are ready to start up without delay as soon as a satisfactory agreement is reached. Rathbone, Sard & Co., of Albany, want 15 per cent. reduction. They can't have that.

Certainly it is not pleasant for moulders to face an inevitable reduction of wages, whether it be 15 or 10 per cent. It is a principle in commercial affairs that the establishment able to produce any given article at the lowest cost can, other things being equal, control the prices at which that article sells in the market, providing the establishment can produce the article in large quantities. Perry & Co. have a five years' contract for the labor of 900 convicts in the Sing Sing prison stove foundry at 65 cents a day each. There has been some question about how much work a prisoner does; but Mr. Perry himself says in a pamphlet extensively circulated before the last election: "Perry & Co. have shown by their records that convict moulders produce but *forty-seven per cent.* as much as citizen moulders." Here we have a basis for comparison. Following this out, it is easy to figure what a citizen moulder must work for in order to compete with convicts. It is $1.38 a day. And this competition can not be dodged in a time like the present, when the problem of "overproduction" must be met and solved in some way as best it can. Stove manufacturers and workmen, therefore, may as well commence figuring out the per cent. reduction of wages and selling prices necessary to compete on an even basis with the products of the 900 Sing Sing prisoners. Ten or 15 per cent. is not enough reduction. It is not one-half or one-third enough. But how far will the reduction go before many stove manufacturers decide to shut up their works rather than sell at prison prices, and moulders seek other occupations rather than work at starvation wages? As a contrast to this course the State of New York has bound itself to furnish regularly 900 convicts for five years to Perry & Co. for stove making. If that firm don't employ the prisoners they are bound to pay 65 cents a day each for them. They are, therefore, quite likely to run their foundry full force and full time, no matter what outside stove manufacturers may do.

Last November, by a popular majority of 139,000 votes, the people of the State of New York demanded the abolition of the iniquitous prison contract system. At the same time they chose a legislature to make the laws. The legislature is now in session at Albany, where the stove works are about to reduce wages so as to maintain their business in the face of prison competition. The duty of the legislature in this matter is plain. A law should be enacted without delay forbidding any more prison contracts. A bill to this effect has already been introduced, and the people will watch the course of their representatives upon this question with an interest that will not die out when the session is ended, and the members have placed themselves upon record. Whatever they may do this winter the prison contract system cannot long survive, and those public men who stand in the way of its abolition will have cause to regret being so well remembered when future political honors are sought.

Making Railroad Collisions Harmless.

An inventor has just received a patent for a device for stopping railroad trains without damage in case of a collision. It is an arrangement of long air cylinders in which a piston acts. The device is intended to run at the end of every train, and when a rear collision happens the piston will deaden the blow by compressing the air in the long cylinders. The car is meant to form an elastic cushion which will receive any blows from a colliding locomotive with impunity. We have no doubt but the device is perfectly practicable, if properly constructed. Were collisions recognized as a necessary adjunct of railroad operating, the stopping device would no doubt receive patronage. Collisions are far too common, but railroad companies will hardly proclaim to the public that they are unavoidable, as they would certainly do by adopting a device to render their effects harmless. Railroad collisions are like boiler explosions, the result of carelessness or criminal recklessness, and proper means of prevention is what public safety demands.

The Steam Whistle.

Steam whistles are not in good repute at present, especially those toned in the enterprising style which tend to pull a sound sleeper out of bed when a sudden shriek is emitted. A recklessly used steam whistle can inflict more torture on sensitive people, through their auditory nerves, than the average bad boy can put upon a nervous sister.

This is the reason that a certain portion of the community has come to regard the inventor of the steam whistle as a fiend sent to punish the human race. With all its faults, however, the steam whistle has the approbation and patronage of the mechanical world, and it has done more good as an unmistakable alarm signal than it has done harm by encouraging profanity or by killing off supernervous people.

The first kind of whistle that steam was applied to was an adaptation of the common toy whistle. It did not work well, and was devoid of any leading capability for ear-piercing noise. The cup whistle was invented by one William Stephens, a workman in the Dowlais Iron Works, in Wales, about sixty years ago. Mr. Stephens seemed to have no idea what noise his invention was destined to make in the world, for it was not patented, nor was its worth proclaimed beyond the borders of the Welsh hills. A workman belonging to Sharp & Roberts, engineers and machine builders, of Manchester, England, having gone to Wales to do some work, was struck with the novelty of the cup whistle and made a rough sketch of it, which he carried to Manchester. Mr. Sharp, who was a very sagacious mechanic, and afterwards did the principal business of introducing the Giffard injector, saw that the steam whistle might be useful on railways, which were then in their infancy, so he commenced making it. The firm still preserves the sketch of the first whistle brought by Mr. Stephens from Wales.

The Stevens Locomotive Valve Gear.

The statement which we publish on another page, showing the performance of four locomotives running on the Central Pacific Railroad, deserves the careful study of master mechanics, owing to the extraordinary record made by engine 48, which is equipped with the Stevens valve motion. In other respects engine 48 does not differ materially from the three engines running against her. The grate area is larger than the others, but the heating surface of this engine is more limited than any of the three competing engines. That the 48 evaporated nearly a third more water than the others to the pound of coal consumed, must have been due in a great measure to the engine doing her work with a softer exhaust, which would result from the steam being expanded to a low tension. This in itself was an important gain, but the economical triumph of the engine lies in the fact that the valve motion admits of cutting off the steam early and holding it till near the end of the stroke. The statement shows practically that this engine did twice the amount of work performed by the others on a given quantity of coal.

Nearly all engineers admit that the link motion makes a very imperfect distribution of the steam for a freight engine doing heavy slow service. An attempt to cut off steam short, so that advantage may be taken of its expansive power, entails pre-release that opens the cylinder to the atmosphere long before the stroke is finished, and the compression on the return stroke takes away a serious percentage of the power exerted by the live steam. The Stevens valve gear, while little more complicated than the link motion, remedies the worst features of the latter motion. Two valves are employed of the Allen type, but with auxiliary exhaust ports. The valves are actuated by a device similar to the wrist plate of the Corliss engine, which receives its motion from the cross-head, and a sword arm, which is operated by a single eccentric. A peculiar feature about the working of this motion is, that it opens and closes the valves with a quick positive movement. When the cross-head has moved 2 inches from the beginning of the stroke in full gear, the port is wide open, and it remains that way till the piston reaches 28 inches of the stroke, when it closes as suddenly as it opened. When cutting off at 9 inches, the port is opened $\frac{7}{8}$" at the beginning of the stroke, and remains open till the piston reaches 27 inches of the stroke, when release takes place. Compression does not begin till close to the end of the return stroke. In the AMERICAN MACHINIST of September 29, 1883, we published three indicator cards of this engine, which show a steam distribution equal to that of our best automatic cut-off engines.

High Uses for Locomotive Whistle and Bell.

The first locomotive put upon a railroad in Peru, from this country, was made by the Rogers Locomotive Works, and was set up by W. W. Thompson, who now runs an engine on the Third Avenue elevated railroad. When the engine arrived it excited much curiosity, for it was different in many respects from the English locomotives which were formerly at work on the road. Some of the engineers round thought the Yankee locomotive would fail on the heavy grades, but it soon demonstrated that its tractive power was beyond anything that had formerly turned a wheel on that road. The locomotive superintendent was particularly struck with the force of the Rogers engine whistle, so he took it off and put it on the engine-house at the shops to call the workmen to work. The natives were very sleepy, not to say lazy, and the conclusion was that nothing would rouse them in the morning if that whistle failed to do it. The bell was considered a superfluity on the engine, so it was taken off and put on a church, and to this day that Rogers bell is said to be calling sinners to repentance.

In a recent order of the Secretary of the Navy, fixing the pay of petty officers and enlisted men for the year 1884, an almost universal increase over the pay for 1883 is noted, two exceptions, however, being in the pay of machinists and boiler makers, the former being reduced from $76.50 to $70, and the latter from $41.50 to $41 per month. The pay of machinists may be still considered fairly good, comparatively, but of what use such an apology for a boiler maker, as can be hired for $40 a month, would be on shipboard is not clear to the uninitiated.

The majority of those not acquainted with the entirely mysterious workings of the Navy Department, will suppose that the services of a boiler maker will be required, if at all, in the instance of emergencies calling for the highest skill and best judgment.

The American Society of Civil Engineers, which has done more than any other organization to effect a reform in our time standards, put its principles into practice at the recent meeting in New York by regulating the order of business according to the twenty-four hour clock dial. D. J. Whittemore, the newly elected president, called the meeting to order at twenty minutes to fifteen o'clock, and a clock in the meeting room indicated the full number of twenty-four hours. The proposed change in the methods of indicating time occupied a considerable part of the Society's attention during the meeting.

QUESTIONS AND ANSWERS.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common sense methods.

Every question, to insure any attention, must invariably be accompanied by the writer's name and address. If so requested, neither name, correct initials, nor location will be published.

(38) S. V. K., Minneapolis, Minn., asks: What strain will a good piece of cast-iron, ½" square, stand, the piece being supported on blocks 11" apart, and the strain applied at the center by means of a screw? *A.*—About 350 lbs.

(39) A. B., Adrian, N. Y., asks: How shall I plane key-ways in a pair of hammer dies, so as to take an oblong key diagonally, half in each die? *A.*—Make a template the exact shape of the part of key in each die, and plane the pieces to the template.

(40) A. P. T., Grinnell, Iowa, asks: Will a siphon work over a hill 100 feet high, provided the point of delivery is lower than the point of entry? *A.*—No. Water can be carried no higher in a siphon than it can be drawn by a suction pump, or about thirty feet.

(41) J. R. C., Chattanooga, Tenn., asks: In chasing a taper tap in a lathe without taper attachment, what should I set my tool by? *A.*—Set your tool so as to cut the thread at right angles with an imaginary line extending from the point of one center to the other; in other words, so as to cut the thread at right angles to the axis of the tap.

(42) D. S., Branford, O., writes: A 20" pulley on line shaft, running 220 revolutions per minute, drives a countershaft by means of a 5½" pulley. On this countershaft is a 14" pulley, which drives another shaft by means of a 1" pulley. What is the speed of the last-named shaft? *A.*—Without allowing for slip or creep of belts, the speed of the last shaft is:

$$\frac{220\times20\times14}{5\frac{1}{2}\times1} = 11,200$$

revolutions per minute.

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Spanish translations of catalogues, circulars, &c. J. M. Da Rosa, 260 East 3d St., Cincinnati, O.

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Patents.—Franck D. Johns, Att'y at Law & Solicitor of Patents, 617 Seventh St., Washington, D. C.

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R. Dudgeon, 24 Columbia st., New York, Improved Hydraulic Jacks and Roller Tube Expanders.

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MANUFACTURES.

Dalton, Ga., is to have a $100,000 cotton factory.

At Portland, Oregon, the Northwestern Foundry Company has been incorporated, with a capital of $200,000.

The Kansas City, Fort Scott and Gulf Railroad proposes to construct extensive shops during the present year.

A stock company for the establishment of a cotton mill has been organized in Shreveport, La., with a capital stock of $150,000.

The Windsor Locks Steel Company, of Windsor Locks, Conn., is now running night shifts, and is adding considerably to its plant.

The cotton factories of New England and the silk factories of Paterson, N. J., are reported very dull. Reductions of wages are threatened.

The Francisco Axe Company, Niagara Street, Buffalo, N. Y., are building a new brick factory four stories high, and are putting in a new Babcock & Wilcox boiler and a new engine.

The Peck, Stow & Wilcox Company, of Southington, Conn., will build a new shop to take the place of the one recently burned at Cheshire. Efforts are making to have the company erect its new shop in Middletown.

It is the intention of the directors of the Edwards Manufacturing Company, at Augusta, Me., to commence the coming spring the erection of a new mill opposite the present mill, on the river side, to be used as a large weave mill.

Seymour & Whitlock, of Newark, N. J., have published a new catalogue describing the Seymour differential press, and the line of tools this firm manufacture. The catalogue is very handsomely got out, most of the cuts being admirable specimens of the engraver's skill.

The prolonged strike of glassblowers has led to the starting of nine co-operative glass factories by the workmen who went on strike. The new works are situated at Elmer, N. J.; Atco, N. J.; Bridgeport, N. J.; Tacony, Pa.; Redmond, N. J., and Bellaire, Ohio.

The Ames Manufacturing Company, of Chicopee, Mass., has received an order from the Winchester Repeating Arms Company, of New Haven, for twenty-two spindle edge-milling or profiling machines, ten to be delivered in sixty days and ten in ninety days. The order is one of the largest ever given for such machines, and amounts to $13,000.

Miller, Metcalf & Parkin are soon to begin the erection of additional buildings at their Crescent Steel Works, in Pittsburgh, Pa. One building, which is to be of iron, will be 120x140 feet, and cost $7,000. A melting-house, which is to adjoin, will be 100x45 feet, and will cost $3,000. The firm will also erect a new brick machine shop, 330x25 feet, at a cost of $5,000.

E. F. Brock & Co., of Sterling, Ill., are building a new line of improved combined punches and shears, hand lathes, milling machines and patent wrought-iron sleds, the running gear of the latter being made in one piece. Their works have recently been enlarged by an addition to their wood-working department, and a full force of men is kept constantly at work.—*Industrial World.*

The Betts Machine Company, Wilmington, Del., have issued a new illustrated catalogue of machine shop tools and appliances made by them. It is a neatly-printed 80-page pamphlet, and tells about what the average purchaser wants to know about each machine and tool. They keep medium-sized tools on hand, and keep castings on hand to build lathes, planers, turning mills, etc., in from four to eight weeks.

The Spencer Arms Company, of Windsor, Conn., has twenty men at work on models, and is preparing specimen rifles for many of the European Governments. The machinery for the factory now building by Pratt & Whitney, of Hartford, will be delayed for a month or two, owing to some recent changes in the Spencer rifle which make a change in a part of the machinery necessary.—*Manufacturer's Gazette.*

The Southwark Foundry and Machine Company (Engineers and Machinists), Philadelphia, Pa., write us: "From our standpoint the conditions of trade seem much more favorable than a year ago. We are receiving orders for engines freely, and more inquiries than at any time during the year. We have on hand a large amount of work, and our prospects are certainly more promising than they have ever been."

The Brush Electric Light Company, Buffalo, N.Y., have just ordered six new boilers, 90 horse-power each; Hinz & Munschauer have ordered a 40 horse-power boiler; John T. Noye & Son, mill machinery manufacturers, have just ordered a 60 horse-power boiler, and the Water-Works of Buffalo are having 400 horse-power of boilers and a pumping engine of 5,000,000 gallons' capacity, built by the Holly Manufacturing Company.

The Rollstone Machine Company (Wood-Working Machinery), Fitchburg, Mass., write us: "We have prospered the past year, done a very fair business, but have not been crowded with orders, as through the year 1882. 1884 starts in with bright prospects, and we have at this time a large number of orders, and work some overtime. We feel that by the aid of your valuable paper, as well as others, we shall be able to run full time through the year."

The Boston *Commercial Bulletin* says: The weekly pay-roll of the Providence (R. I.) jewelry industries has averaged throughout the past year $50,000. All the solid work manufactured here goes to New York, whence it is sent all over the country as far even as San Francisco, and up the coast as far as Puget Sound, and southward to the Gulf. There are about 200 jewelers' workshops in this city alone, and about 3,000 jewelers, or about 10 000 of the population who find their support from this industry alone.

Davis & Russell, engineers and machinists, 40 Morris Street, Jersey City, N. J., are making a large, vertical, compound engine for the steam-tug Walter J. Tice. The cylinder dimensions are: High-pressure, 13 inches diameter; low-pressure, 24 inches diameter, with a stroke of 18 inches. The cylinders are arranged tandem, with the high-pressure cylinder on the top. In planning the motion for this engine, the designer has arranged to move the high-pressure valve by an offset stem, which enables the valve-seat to be placed close to the cylinder, thereby avoiding long steam ports.

E. E. Garvin & Co., 139-141 Center Street, New York, machine tool-builders, write us: "During the year 1883 we added one floor to our shop, seventy feet square, which is stocked with machinery now running. We have added to our list of tools a compound milling machine for milling the arms of sewing machines, and a small automatic milling machine for light cuts. Besides, we have improved our edging machine, cutter grinder and other tools. Have about 125 men at work, which is a larger number than one year ago. No change has been made in wages. Prospects fair."

Bradley & Company (Cushioned Helve Hammers and Harvesting Machinery), Syracuse, N. Y., write us: "The sales of our product for 1883 in some lines has been considerably larger than for several preceding years, and in all departments business has been as satisfactory, both in volume and results, as could have been expected, taking into account the discouragements that have arisen, especially in the agricultural world. We anticipate for the coming season a fair business, and, if good crops should result, increased activity may, we think, be expected. We are running full time and full force."

According to a review in the Baltimore *Manufacturers' Record*, there are now 314 cotton mills in the South, having 12,761,422 spindles and 24,873 looms, while at the time the census was taken, in 1880, the South had only 180 mills, with 713,989 spindles and 15,222 looms. The largest increase in the number of mills was made in North Carolina, where a gain of forty-three mills and 110,595 spindles is exhibited, while Georgia made an increase of 139,156 spindles and twenty-two mills. In 1880 the value of the manufactured cotton produced at the South was a little over $21,000,000, while in 1883 the value had risen to between $35,000,000 and $40,000,000.

B. Burbank & Co. (Miners and Shippers of Fluor Spar, a powerful Flux), Evansville, Ind., write us: "We have to report a large increasing demand the past year for fluor spar, particularly among iron-founders, who are the largest consumers, although used by glass manufacturers and in the reduction of silver and lead to quite an extent. Still, the increased demand comes from the founders, owing, probably, to the low price at which it is now sold. It bears transportation to any portion of this country and to Canada. It was formerly imported, but we have the honor of stopping all importation, as we deliver a better article to New York at a much less price than the imported."

The Long & Allstatter Company (Agricultural Implements, Power Punches and Hammers), Hamilton, O., write us: "We can report a small increase in the volume of business for 1883 in our machine department over that of 1882. More than double the number of orders were received in December last than in the corresponding month in 1882, and we begin the new year with more unfilled orders than in January last. We are now erecting an additional three-story warehouse to accommodate the demands of our increased trade in implements. The sales in this department last year were over 100 per cent. greater than for the preceding year, and we anticipate a like increase in 1884 over the year just closed."

The Brainard Milling Machine Company, Hyde Park, Mass., write us: "Business for the past year has been with us entirely satisfactory, and we have not reduced our force, wages or hours of labor. The prospect is fair for the present year, though it is evident that the machine tool business is overdone. We have used the opportunity afforded by the partial lull to add improvements to our older-style machines, and to bring out others that we have long had waiting. Among these are a large milling machine for general heavy work, weighing nearly four tons; a double-head milling machine for squaring two ends at once of long work; and a line of automatic gear-cutting engines."

The Geo. F. Blake Manufacturing Company, Boston, Mass., write us: "We are more than pleased with the result of our last year's business, which has greatly exceeded in volume that of any previous year. The increasing demand upon us has necessitated the purchase of more machinery, which, in consequence, has added greatly to our facilities for turning out work. During the year we have made many new improvements both in construction and design, and have introduced some special lines of pumping machinery. In the line of water-works pumping engines, we have been very busy, and have placed in successful operation more of this class of machinery than ever before. With the opening of the new year, we find ourselves with a large number of orders, and the prospects are for a very prosperous year."

The Knowles Steam Pump Works, Boston, Mass. write us: "For the year just expired we have to report an unusually good business, with no dull months. The increased demand for our regular line of pumping machinery, besides the introduction of several novelties in the same general line, has necessitated the purchase of new tools and the erection of a new brass foundry in connection with our works at Warren, which we have but recently completed, and which is fitted with improved facilities for turning out work as rapidly as possible. The demand for pumping engines has steadily increased, and we are now completing the setting for a pair of two million gallon pumping engines for the Wakefield (Mass.) Water-Works. Besides the manufacture of compound engines, we have had quite a large business in power pumps for water-works, with a range of capacity from a half million to three million gallons per day."

F. H. Jackson, Angelica, N. Y., writes us: "The Lackawanna and Pittsburgh Railroad, which is about to open its line for business, makes, with its connections East and West, a seventy-mile shorter route between New York and Chicago than any other line. The main offices are located here, and the repair shops are soon to be built here. The Lackawanna and Pittsburgh road is now building a fine depot at this point. We are only about 2½ hours' ride from either Buffalo, Rochester or Bradford, and parties looking for a point to locate manufactories would do well to look to the advantages of Angelica. The population is 2,000. It is reported that Geo. D. Chapman, of this place, will put up extensive machine shops in the spring. Brown & Lockhart, manufacturers of manilla wrapping paper, keep their mill running from twelve o'clock Sunday night until twelve o'clock Saturday night. Their 125 horse-power Buckeye engine, which has been running a year and a half, is giving the best of satisfaction."

The Lidgerwood Manufacturing Company, 96 Liberty Street, New York, have recently shipped two hoisting engines to Messrs. Beckwith & Quackenbush, contractors for the new Washington aqueduct. These engines were specially designed for the purpose of operating on the construction of this tunnel. While the shafts, which are from 100 to 200 feet deep, are being opened, the engines will be used for hoisting material. After each shaft is sunk to the level of the tunnel, it is to be used as a double compartment shaft, running two regular platform cages automatically, one up and the other down. These hoisting engines are very powerful, with cylinders 8¼"x10". They have compound gearing, and are capable of hoisting 6,000 pounds at a speed of 175 feet a minute. The engines are fitted with the company's improved throttle-valve attachment, and are designed to stop automatically. The lowering of the tub is controlled by a powerful foot brake.

There are some very heavy tools in course of construction in the erecting shop of the Hewes & Phillips Iron Works, Newark, N. J. One planer is eight feet square, has four heads and a travel of forty feet. There is a cutting head on each of the uprights and two on the cross-head. There are also several 60-inch lathes for export, and several small planers for Western railroad shops. A pneumatic riveting machine of the Allen patent has recently been commenced. This is a heavy machine, capable of giving a pressure of fifty tons on the rivet. It is for a new shop in Jersey City, and is intended for use in building heavy compound marine engine boilers. There are several Corliss engines on the floor—one well advanced, having cylinders 17"x30". This firm has made arrangements to build Corliss engines of fifteen sizes, ranging from 12"x28" to 26"x60". The engines are made with five long bearings and heavy shaft. All the forgings, except the shaft, are of steel. All the small parts, such as the connecting rods of swing plate, crab claws, etc., are made interchangeable. The cross-head is made with wedge-shaped movable shoe, which takes up lost motion. This shop's facilities have been extended by the putting in of ten new tools to replace others that had become antiquated and worn out. Among the new tools is a particularly heavy planer,

Machinists' Supplies and Iron.

NEW YORK, January 17, 1884.

The supply business shows but little change since the beginning of the year; but generally dealers are doing a safe business in approved standard goods, with but little inclination to push untried novelties.

Manufacturers are well prepared for business, and anticipate a fairly good year.

In American pig iron, the fact that orders are being placed for delivery ahead, in some instances extending through six months, creates a better feeling, showing that consumers have more confidence in the future. Prices are quiet, at No 1 X Foundry, $20 to $21; No. 2 X, $19 to $19.50; Grey Forge, $16.50 to $17.20.

Scotch Pig is dull, with prices tending in buyers' favor. We quote: Coltness, $22.50 to $23; Glengarnock, $21.50; Gartsherrie, $23; Summerlee, $22.50; Eglinton, $20 to $20.50.

Antimony is in small demand, but with the small supply in hand is held firm at, Hallett's, 10¾c. to 10¾c.; Cookson's, 11¼c.

Copper sells at, Lake, 14¾c. to 15c.; other brands, 14c. to 14¼c.

Lead is firm, at 4.40c. to 4.50c., dealers professing ability to hold it at these prices.

Spelter—Refined, 8c. to 8¾c.

Tin rules firm, the price being influenced by an advance in London. We quote: Banca, 20c. to 20½c.; Straits and Malacca, 19¼c. to 19¼c.

✲WANTED✲

"Situation and Help" Advertisements, 30 cents for each seven words (one line) each insertion. Copy should be sent to reach us not later than Thursday morning for the ensuing week's issue.

First-class mechanical draughtsman desires engagement. Address E. H., care AM. MACHINIST.

Wanted—A good moulder on small and medium engines. Address K., AMER. MACHINIST, with age, references, and wages expected.

Young man wants situation. Has had experience in designing, draughting, constructing and erecting machinery; also in management of men. A. Blauvelt, 358 Clinton Street, Brooklyn, N. Y.

Wanted—A foreman machinist; one competent to design, construct and erect machinery. None but those thoroughly capable need apply. Address, P. O. Box 1358, New York City.

A good draughtsman, of ten years' experience on locomotive work and general machinery, is open for an engagement. Experienced in shop. First-class references. Address, Valve, AM. MACHINIST.

Wanted—Situation in a machine-shop office, by one accustomed to all details, as practical machinist, draughtsman and book-keeper. Address, Machinist Book-keeper, care AMERICAN MACHINIST.

Wanted—A superintendent or foreman: must be competent as designer and to erect machinery, and fully capable to take charge of men. Address, giving age, experience and reference, Box 12, care AMERICAN MACHINIST, 96 Fulton Street.

Wanted—Situation as foundry foreman. Has large experience in all kinds of machinery: core making, melting and mixing of irons, and the general management of men. Best of references. Address, R. H., Box 4, AM. MACHINIST.

A practical man, experienced in the management of a machine shop, wants a situation. Competent to design, estimate costs, and superintend the whole business of the ordinary foundry and machine works, from taking the order to making out the bill. Steam engines or general jobbing much preferred. Expectations not less than $1,200 a year. Would put skill against capital. Correspondence solicited. Address, F. J. Masten, Box 392, Pullman, Ills.

Tools Wanted—One good strong engine lathe, 36" swing, 10 feet between centers, that will cut heavy screws and for boring cylinders, etc.; also one Helve hammer, to work up to 6" iron; to sell, one 200 lb. Ferris & Miles steam hammer, in good order; to sell, one 2" hand bolt and pipe threading machine. Geo. R. Lombard & Co., Augusta, Ga.

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45" Sellers & Co.—Column Drill,
6 Smaller Drills—new and second-hand,
24", 26", 32" Planers,
Small Pratt & Whitney Shaper,
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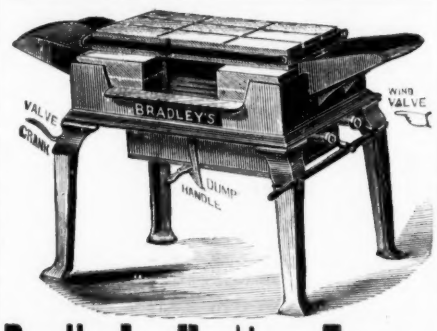

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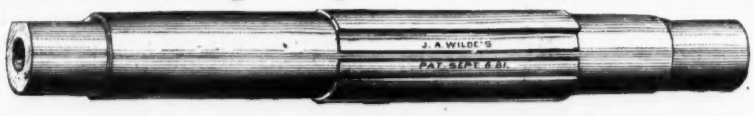

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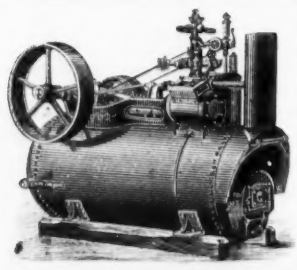

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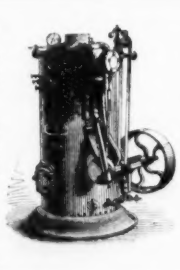

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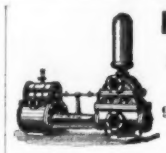

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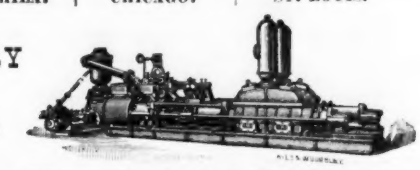

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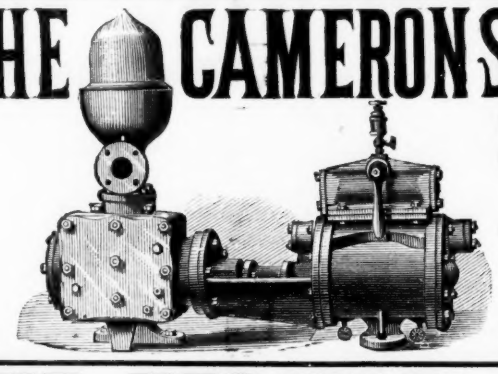

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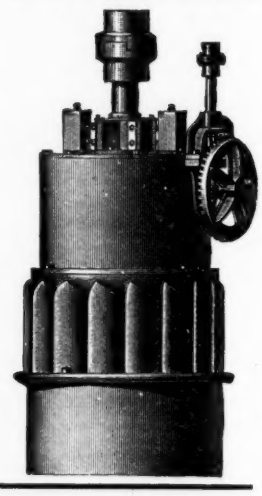

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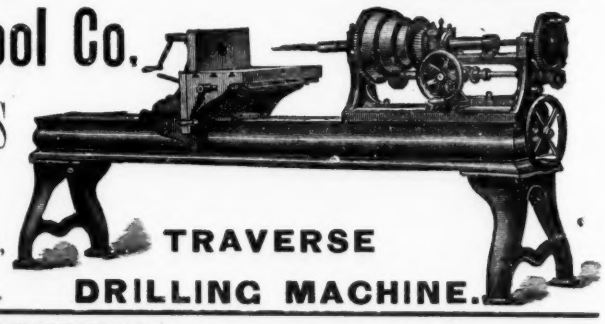

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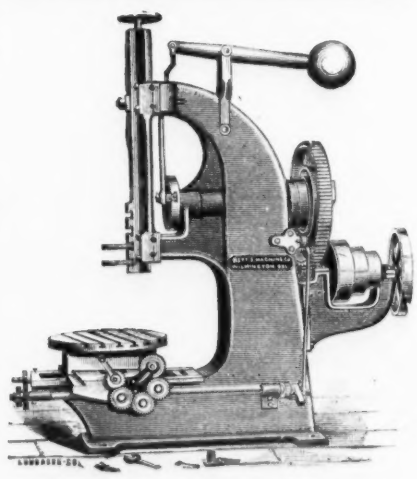

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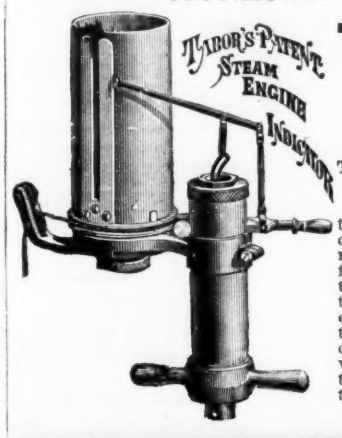

TABOR INDICATOR.

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PROVIDENCE, R. I., Dec. 28th, 1883.

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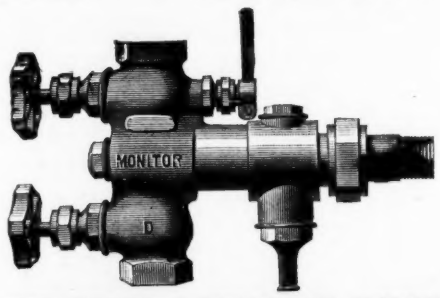

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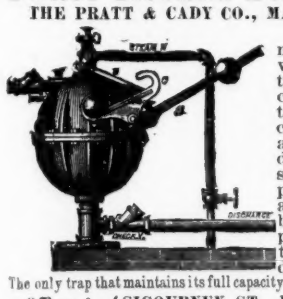

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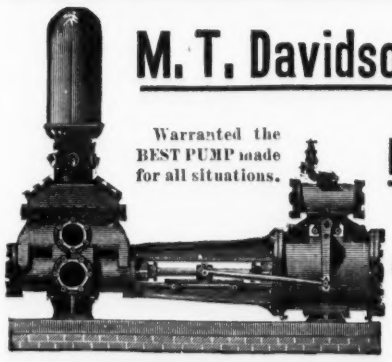

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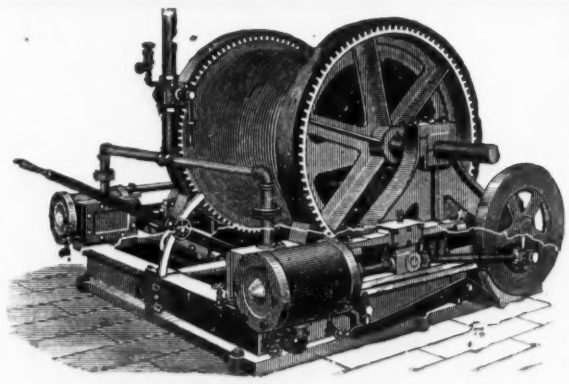

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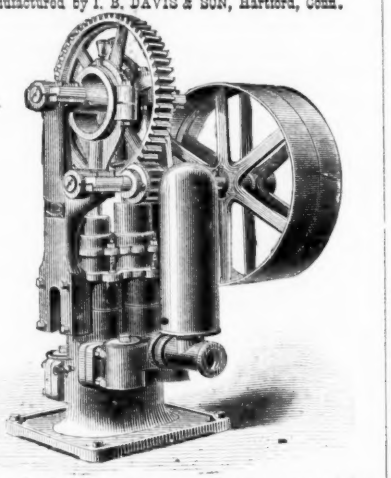

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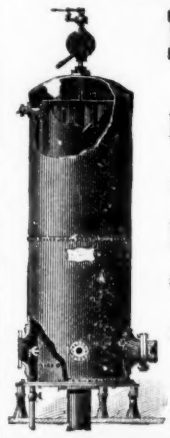

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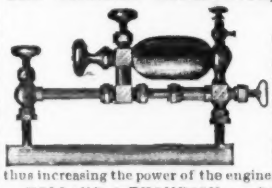

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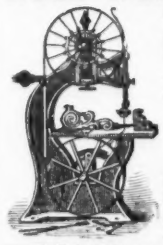

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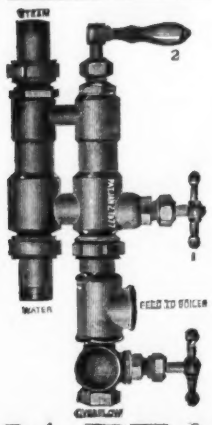

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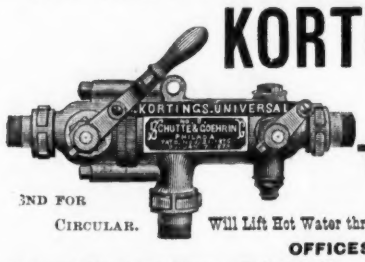

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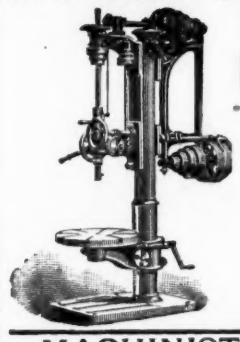

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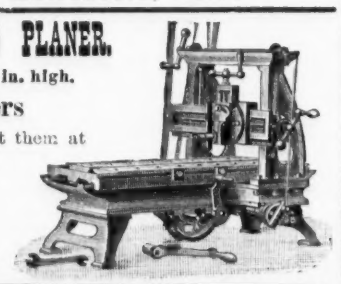

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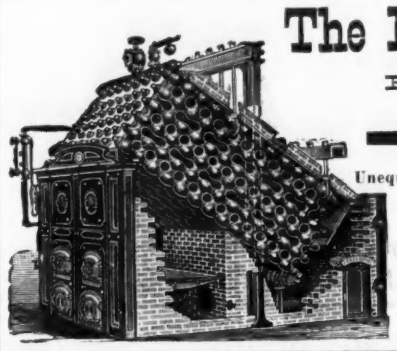

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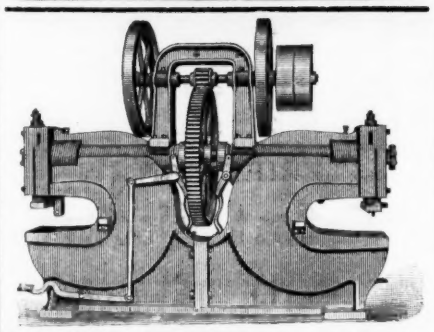

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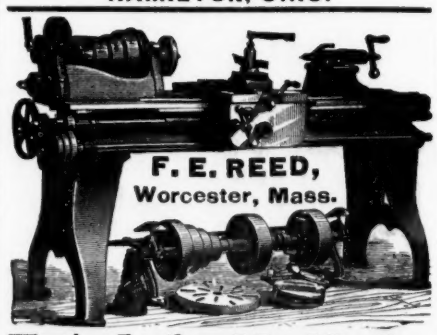

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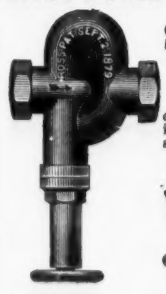

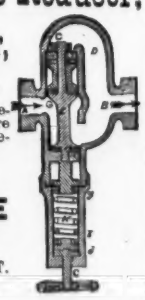

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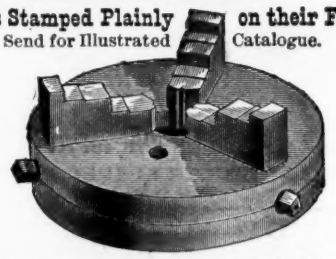

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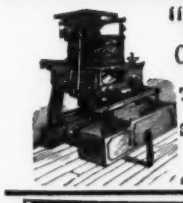

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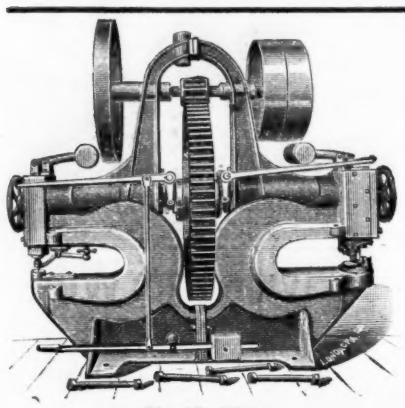

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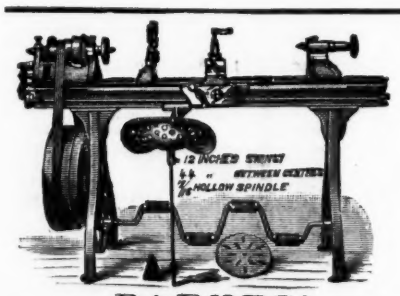

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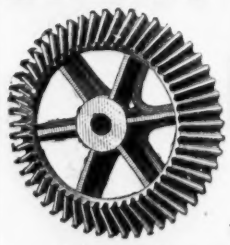

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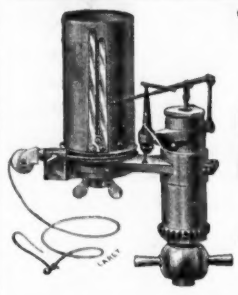

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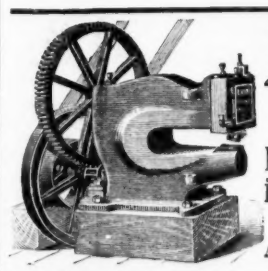

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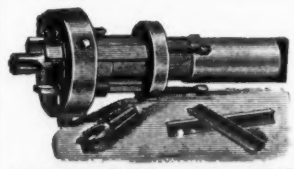

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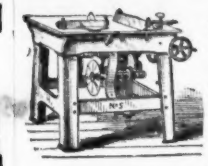

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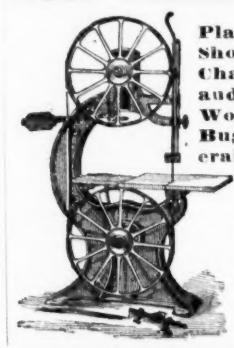

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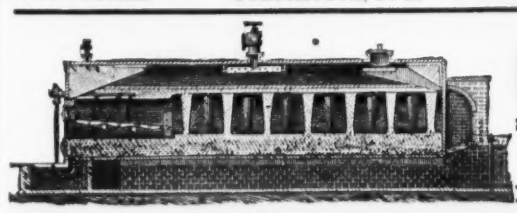

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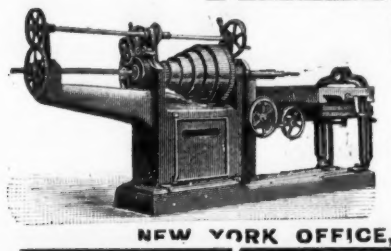

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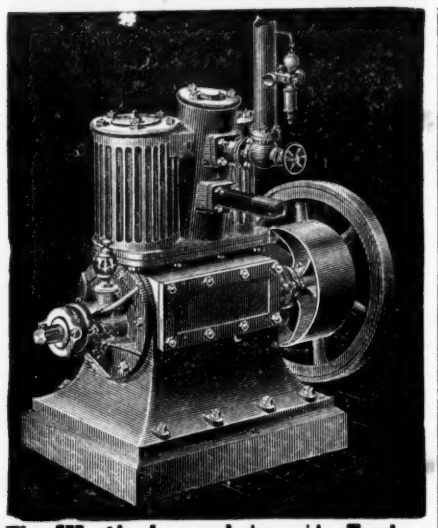

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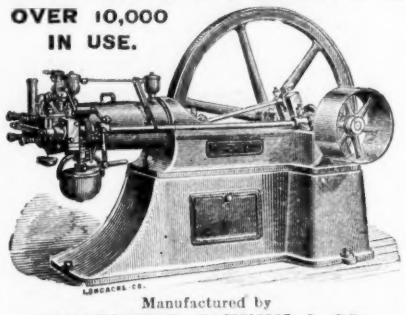

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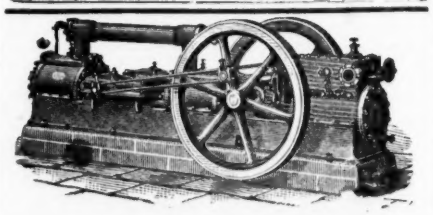

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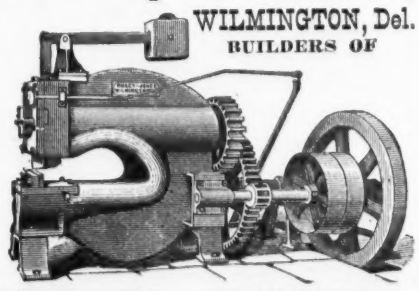

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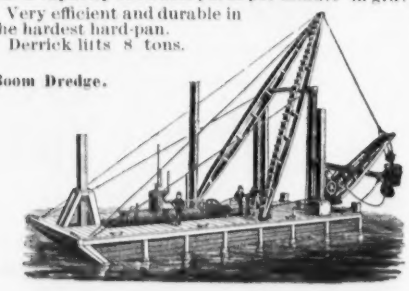

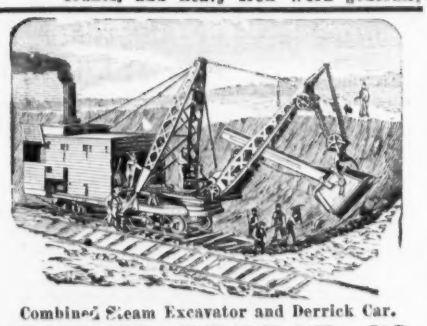

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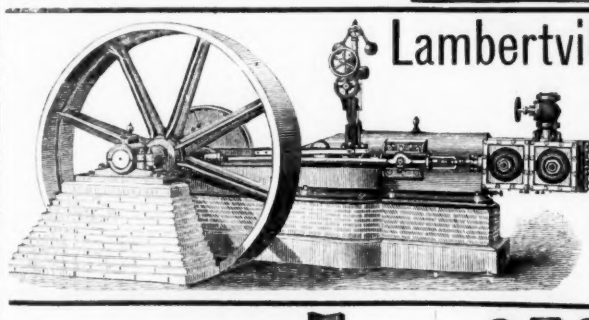

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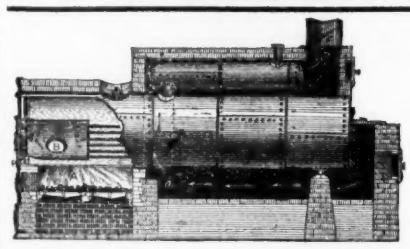

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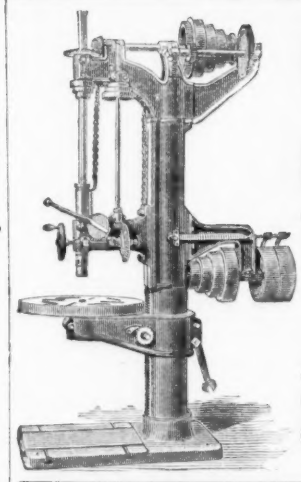

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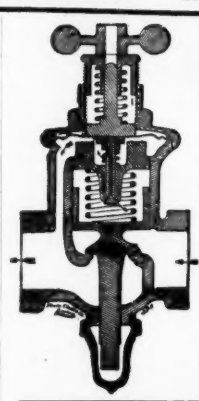

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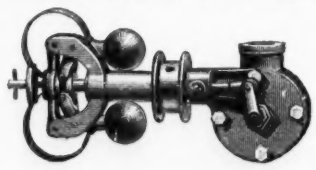

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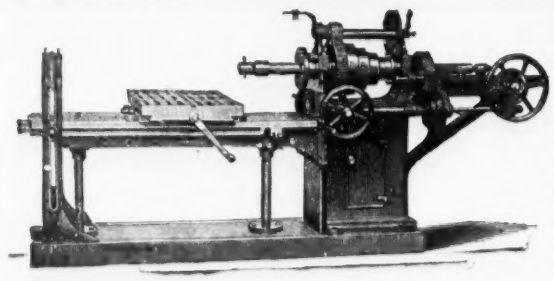

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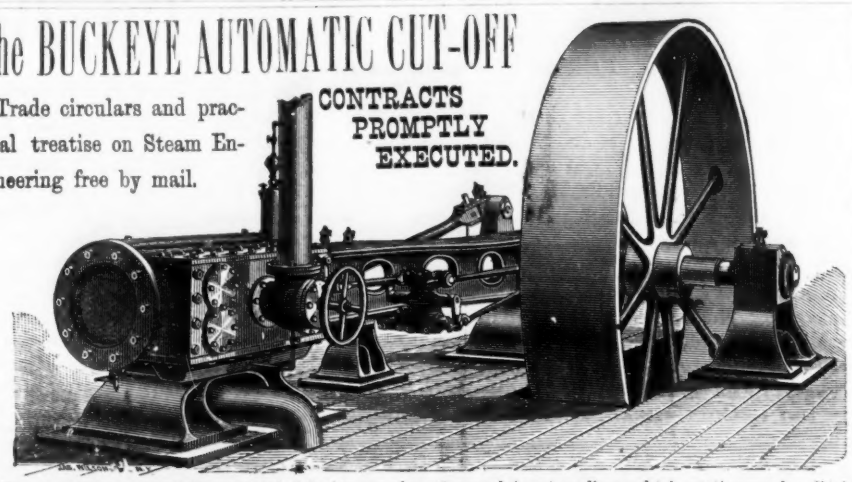

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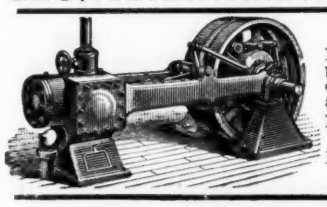

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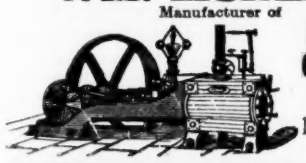

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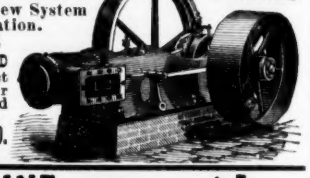

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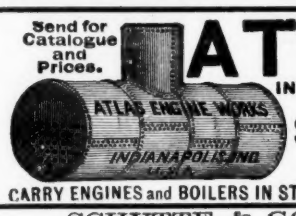

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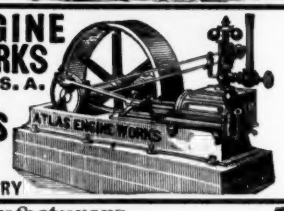

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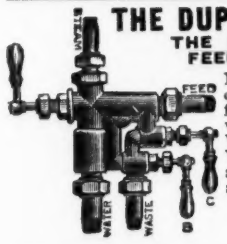

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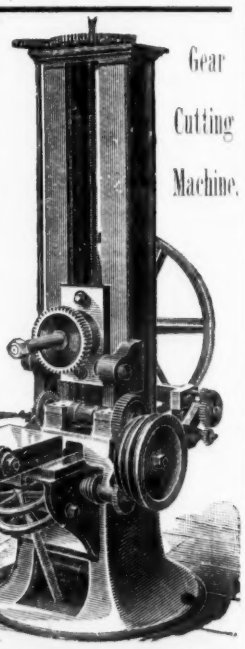

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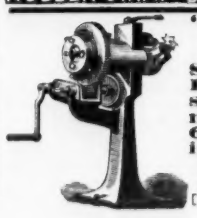

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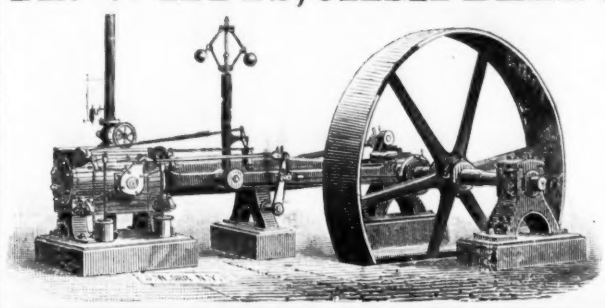

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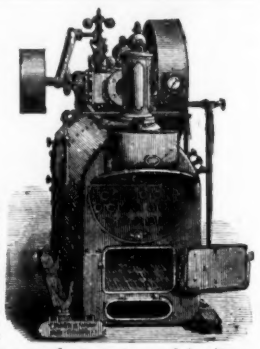

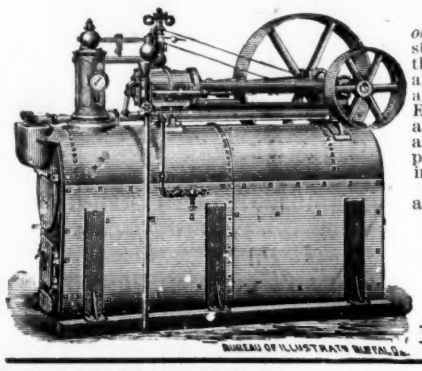

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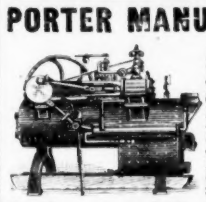

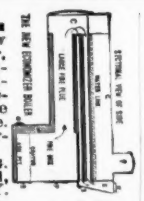

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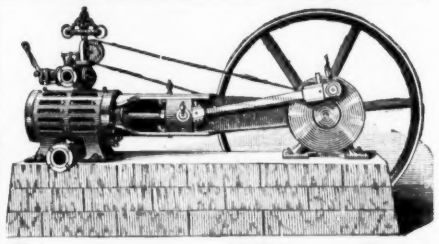

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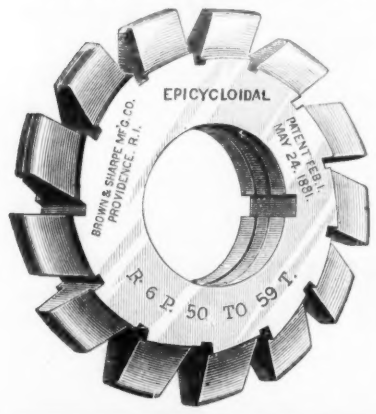

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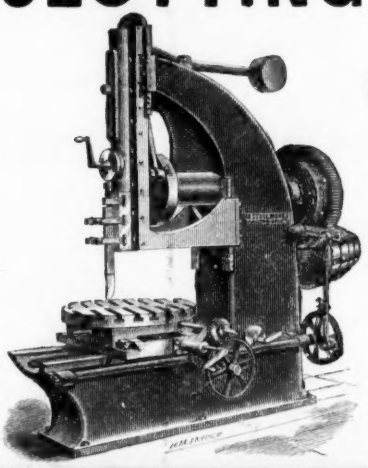

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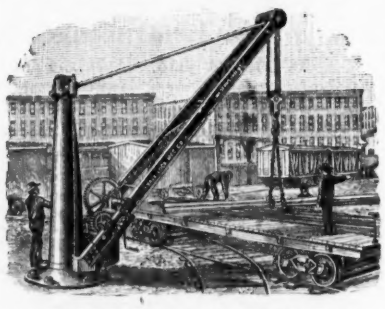

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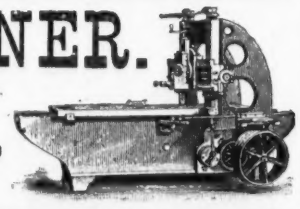

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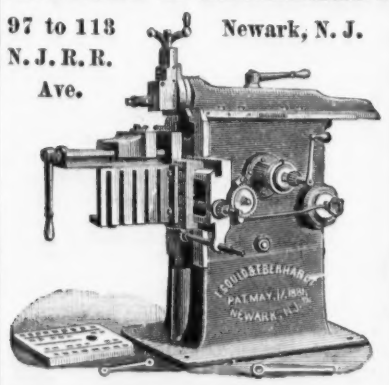

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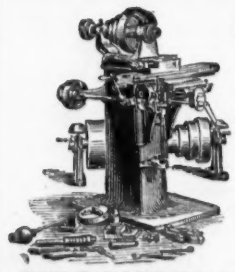

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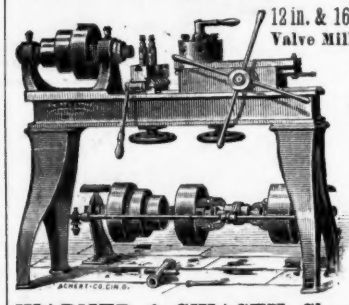

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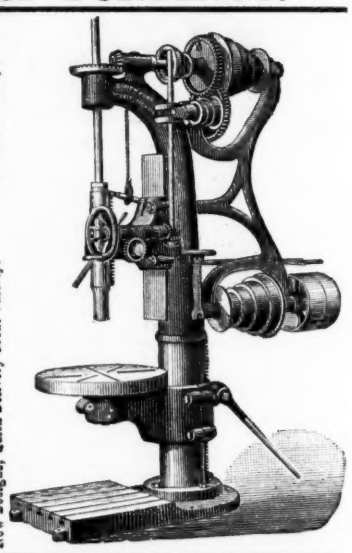

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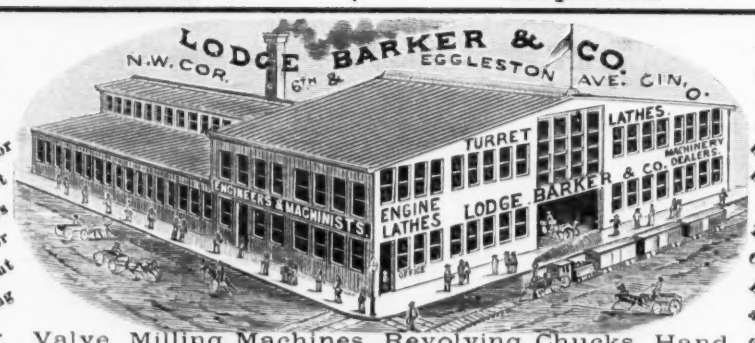
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